

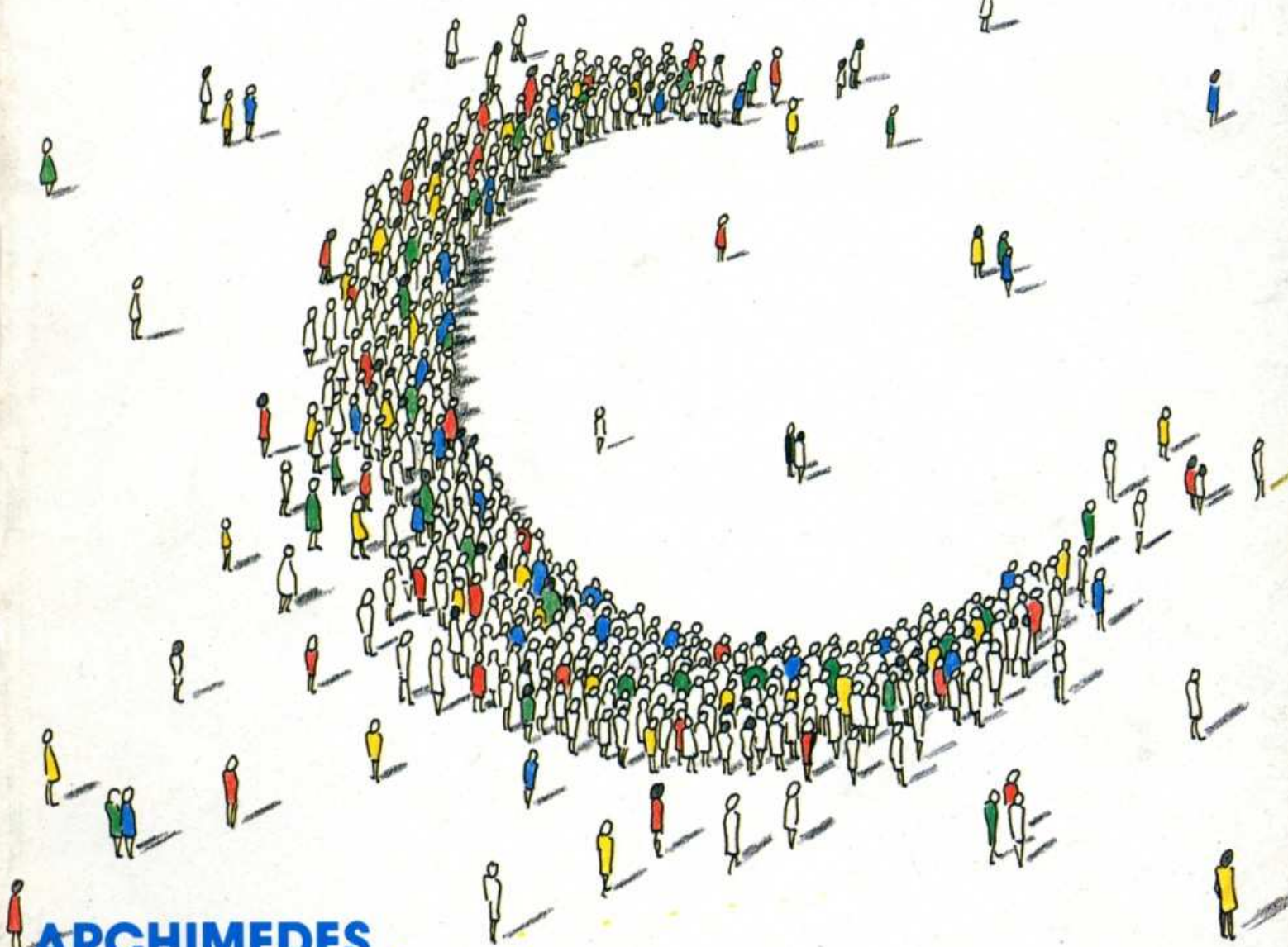
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February 1988
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A&B COMPUTING

FOR BBC MICRO, BBC MASTER & ELECTRON

THE C LANGUAGE

Three Cs do battle inside



ARCHIMEDES

ArcWriter reviewed

DELTABASE AND INTERBASE

ELECTRON SPECIAL

Teletext at last



Leg of Toad, and Golden Fruit, Mix with Ashes and Nightshade Root.

At the end of the thirteenth century, there lived in the land of Lorraine ten wise and powerful Magelords. Each of them had studied sorcery and enchantment from childhood days, and each knew how to evoke potent spells capable of causing metamorphosis and devastation.

You play the role of one such Magelord named Eldon The Spellbinder. Your task is to find the evil Zorn, who has deserted the Magelord brotherhood and fled to the Castle of Lorraine.

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(Compatible with the BBC B, B+ and Master Series computers).

The screen pictures show the BBC Micro version of the game.
The graphics of other versions may vary.

Then, by collecting the correct ingredients, you must mix the Ultimate Spell, cast it at Zorn and banish him for good.

A captivating 3D arcade-adventure full of problems to be solved by magical means. Only the appropriate ingredients mixed in the correct order will produce all the powerful spells which you need to complete your mission of destiny.

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If you complete the Spellbinder mission (by killing the evil Zorn), you can enter our competition. Prizes include a superb engraved trophy, with Spellbinder T-shirts and signed certificates for runners-up.

Closing Date: 30th June, 1988.

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£30 5 1/4 inch Disc (ADFS ONLY) £34 3 1/2 inch Disc
With Digimouse add £35

The ARTROOM pack consists of ARTROOM and ACE (Artroom Colour Extension). ARTROOM is an icon based full screen graphics package which can be controlled by mouse or keyboard. All the usual features are there including 'cut and paste' and our highly acclaimed ZOOM option plus an extensive graphics library to help you produce pictures quickly. An advanced printer dump is also supplied.



'ARTROOM...the best there is.'—
Acorn User
Feb '87

'ARTROOM is the software for you.'
A & B Jan '87

ACE consists of two programs. COLOURIZER enables you to produce MODE 1 colour versions of ARTROOM screens and to dump them to a printer using a shaded printer dump. The MODE CONVERTER program will convert any graphics screen into a Mode 4 ARTROOM screen ready for loading into ARTROOM. Conversions can be made from Modes 0, 1, 2, 5 and 7, yes SEVEN!

'...very pleased with the way Clares have introduced the colour facility.' A & B June '87.

ARTROOM and ACE will work with any mouse but we recommend DIGIMOUSE because it is well engineered using a non-slip ball and optical encoders. DIGIMOUSE also includes the unique 'LINEAR LOCK' facility that enables you to draw straight lines freehand.

'...impressed by Nidd Valley Digimouse' A & B June '87
This complete package is marketed by Olivetti in Italy, the home of style and design.

ACE A STROKE OF GENIUS!

DIGIMOUSE



BETA-BASE

BETA-BASE

SAVE £7

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The Beta-Base pack consists of Beta-Base, the number one database for the BBC micro, and Beta-Base Utilities which extends the power of Beta-Base.

The main feature of Beta-Base is its ease of use which is achieved without sacrificing the power and flexibility required for the efficient manipulation of up to 65,000 records.

The Beta-Base Utilities provide seven new utilities. There are more powerful versions of Search and Sort and there is also a Mail Merge program which creates perfectly formatted letters containing data from your files.

'We use Beta-Base ourselves'
Mike Bibby, Editor of
MICRO USER.

'Rated best value for money'—ACORN USER Dec '84

When ordering please state the following:

Machine
Disc size (5.25, 3.5)
Disc format (40 or 80)
DFS version

N.B. If ordering for a Master or Compact please state DFS or ADFS. The ARTROOM pack is for the Master or Compact only but all other software is available for all machines.

Fontwise + Pack

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The FONTWISE+ pack contains FONTWISE+, the FONT EDITOR and 22 fonts. FONTWISE+ enables you to print very high quality text in a choice of 22 different fonts and 3 sizes. You do not need a special printer. Just an EPSON RX or FX compatible. High quality is not the end of the story because you can also have both proportional and justified text. The output has to be seen to be believed.

FONTWISE+ is compatible with WORDWISE, VIEW, INTERWORD, MINI OFFICE II and EDWORD II.

'FONTWISE is better than many NLQ packages'—ACORN USER Sept '86

The FONT EDITOR is very easy to use and allows you to edit the current fonts or create new ones. Reviewers have praised the editor for its ease of use and faultless presentation.

'editor is impressively quick, smooth and easy to use'—A & B
EDITOR '...puts all previous designers to shame'—BEEBUG July '86

Ask for a sample printout.



UTILITIES PACK

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£50 5 1/4 inch disc £60 ROM £54 3 1/2 inch disc

The UTILITIES PACK consists of RAMROD and MACROM. RAMROD is the ultimate toolkit ROM and it is compatible with the whole BBC range and includes a disassembler plus editors for DFS, ADFS, RFS, memory, Shadow memory, Sideways RAM, Tube plus lots more. RAMROD will take you to the furthest reaches of your machine and enable you to boldly go where no ROM has gone before!

'an ingenious collection of utilities...' BEEBUG Oct '86
'worth its weight in gold' A & B Jan '87

MACROM is a fast full featured MACRO ASSEMBLER that allows the use of macros, which are loaded from disc. MACROM has its own easy to use editor which automatically formats your source code. A HI version of MACROM is supplied for use with the second processor. A macro library and demonstrations are also supplied.

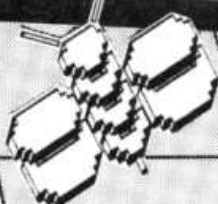
'Full marks for an excellent product.'—BEEBUG JUNE 1986

We are also making BROM+ available under this offer. Its main feature is the full scrolling BASIC editor which allows the user to edit a program as if dealing with text in a wordprocessor. There are many other features dedicated to making life easier for BASIC programmers.

'This is the best BASIC screen editor I have so far used.'
—MICRO USER August 85

For BROM+ add £25 on ROM,
£20 for 5.25 inch disc or £22 for 3.5 inch disc.

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A&B COMPUTING

Volume Five Number Two February 1988

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**ARGUS
PRESS
GROUP**

ARCHIMEDES

Dancing on a High Wire 58
Continuing Archie to Beeb comms.

Red Keys 72
The latest Archimedes news

Archimedes Report 80
The new Archimedes series – 440 hard disc, Fortran and Arcwriter.

Archieball 88
Our very first Archimedes listing – and what a stunner it is!

FEATURES

Mode 7 Heaven 24
For Elk owners only – Teletext at last!

InterBASICS 26
Write your own database with InterBase

Compact Corner 29
Clip on and go with Mertec's innovative new add on

Beyond BASIC – C 62
Three of the best versions battle it out

Know the System 95
How to program System Delta



A full implementation of the
programming language C
FOR THE BBC B, B+ AND MASTER 128

REGULARS

News 6

Online 12
News for comms converts

The Arcade 15
All the latest games are here

Software Sale 38

LEARNING WITH THE BBC MICRO

Read Right! 33
Modern Languages on the Beeb for easy teaching

NEXT MONTH: VIDEO

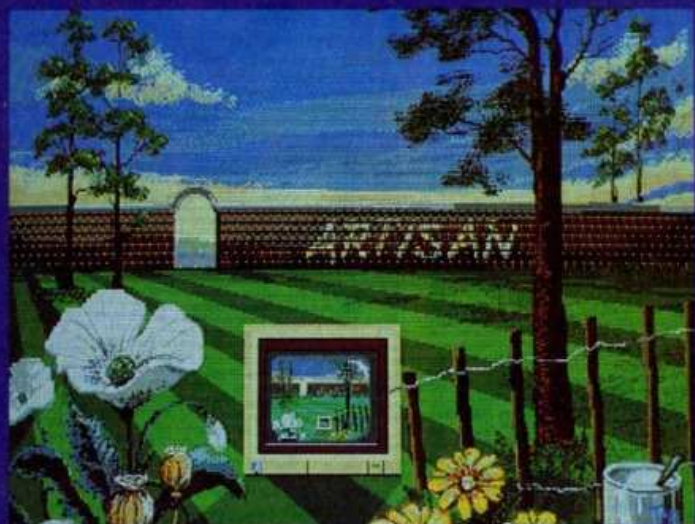
All Masterminds are allowed a specialist subject and A&B's next month is VIDEO.

- Full update on the technology whether you want to digitise, scan or run interactive LV ROM
- If you do it yourself then you will want to get hold of our new software for frame grabbing and picture animation

- There's a full video effects studio with SLIDE, BANG!, DRIZZLE – and all those other jazzy video effects which you see on your tele every day
- You can record these efforts realtime onto a domestic video recorder, no more hardware required.
- So reserve your copy of March's A&B Computing, out on the 5th February.

archimedes

HARNESS THE POWER



A computer like ARCHIMEDES needs software that can match its outstanding capabilities. Our new products do just that and one of the first areas that you will want to explore is the graphics capability. ARTISAN, from the authors of ARTROOM, is the ultimate in graphics packages. Just take a look at the screen shot reproduced here, as they say 'a picture is worth a thousand words'. We can't describe all the features here but some major functions are:

- Full screen
- Fast multi level scrolling zoom
- Image distortion
- WIMP environment
- Magic brush
- ECF designer

Plus all the usual features and some very unusual ones too.

£39.95

PICTURE THIS

—COMPETITION—

Can you do better than the picture shown here? If so you could win yourself a unique prize. If yours is judged to be the best picture then your masterpiece will be transferred to canvas by our artist Jon Warmisham (BA Hons Fine Art). The competition is open ended but the best picture each month will be featured in ACORN USER and a monthly prize will be awarded. Full details are contained in the ARTISAN pack.

Alpha-Base

Alpha-Base is the successor to the hugely successful Beta-Base, the top selling database for the BBC micro. Beta-Base files can even be transferred to Alpha-Base.

Alpha-Base incorporates all the suggestions and requests that we have received over the last five years. All of the standard Beta-Base facilities are there but in a much improved form. In addition there are many new features that will make your life easier. Some of the features are:

- Free format screens
- Multiple pages per record
- 400 fields & 27,600 characters per record
- 2.14 billion records per file
- Multiple display & entry forms
- Fast search & sort options
- Plain English entry of search criteria
- Five data types including formula & date
- Winchester compatible

At Clares we try to give you usable programs. This results in some arbitrary limits on the size of files in Alpha-Base. The limits of 400 fields and 27,600 characters per record are unlikely to restrict you but they enable us to save memory and provide additional features. The only other limitations are due to the hardware. Alpha-Base can handle 2.14 billion records but the ADFS can't!

£49.95

IMAGE WRITER

IMAGE WRITER is a sophisticated WIMP based wordprocessor with the ability to include graphics as well as to use various font combinations. Because Image Writer is document based you do not have to create page layouts for every page. You prepare your whole document in one go. Just type it, add the graphics and print it—simple. The graphics can be created with the built in graphics editor. Image Writer is designed as a first level DTP product and it uses the normal printer fonts to print both text and graphics in one pass. We will of course be producing a full feature DTP when ARCHIMEDES supports the fancy font printing. Image Writer will be available when you read this so please contact us for more information.

£29.95

ARCHIMEDES TOOLKIT MODULE

ATM is the first toolkit available for this powerful new micro. Many of the features that made RAMROD a top seller have been incorporated into ATM and a whole host of new features have been added including:

- 10 Memory and disc editors
- 8 Memory and disc searches (inc. wildcards)
- A scrolling disassembler
- A one line assembler (accessed from the disassembler)
- Shift and compare functions
- Catall and Exall for discs
- Winchester compatible

If you want to explore your ARC then order the ARCHIMEDES TOOLKIT MODULE today. It has enabled us to disassemble modules, discover many undocumented SWI calls and has been an invaluable aid in debugging software. You can even search for mnemonics.

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NEWS

Big Ben Show

Holland's enthusiastic BBC and Electron users recently turned up in impressive numbers to their club show, at which A&B Computing and Disk User were represented for the first time. The show took place in the resort town of Hardwijk on the old Zuider See.

The community centre at which the show was held, was split into three main areas, one for the British firms, one for the main Acorn distributor and one for the demonstration of activities from individual clubs and special interest groups such as education. The Archimedes was the focus of attention in the distributor hall with programmers sitting down at the keyboards to try out their favourite graphics routines to see just how fast they would run.

It's obvious from the club activities that there is a wide and varied range of projects being undertaken. Communications especially featured as a means of making information available from the local area organisations to their members. Nor were beginners ignored. The range and quality of the courses and tutorials available was impressive.

The British contingent, who held up well to the barrage of interested questions, consisted of Dabs Press, Beebug, Towerhill, Slogger, Acorn User/Educational Computing and ourselves.

The Dutch Big Ben club is an amateur organisation developed along professional lines. We were made very welcome and would like to thank the club members, all who visited our stand and Big Ben's representative, Harry Linsen.

Come back Dante

A new adventure game has reached the offices of A&B Computing, it is called *Inferno*, available from Vanadis software.

Just what they mean by the term *5th generation graphic adventure* remains to be seen, although from the accompanying blurb it, looks to be a biggie as far as adventure games are concerned. Two reversible discs include dozens of pages of compressed text (surely more than that?), pictures, puzzles and mazes. There are hundreds of locations which "recreate the

unsettling gothic atmosphere of Dante's mythology"!

The general idea of the game is to wander around the lower reaches of Hades, meet the denizens of a "world beyond redemption" (yeuch!) and generally explore the depths of Hell – you must confront Satan himself in order to reach paradise, to attain eternal power or to be snatched away to eternal damnation – generally meaning dismemberment, petrification or demonic possession – fun stuff ... but a bit dodgy nonetheless!

Contact Vanadis software at 37 Jeune Street, Oxford, OX4 1BN.

Ecologically sound software

British Environmentalists (and some people who answer to the name of Joe Public), are becoming increasingly concerned about the decline in Dolphin sightings in the North Sea. Many reasons have been proposed for this, the ever stupid dumping of waste – ie Pollution, over-fishing, man's exploratory activities and so on...

Topologika software, a software house based in Peterborough have decided to inform us about the Dolphin's plight by writing a software package called **Gentle Giants – Whales and Dolphins**. The package is supposed to teach children more about these amazing creatures whom Topologika would like to see us spending more time studying as we do studying Dinosaurs.

Suitable resource material has been pretty hard to find in the past, but Topologika have created a complete package including 15 complete lesson plans on "Their origin and environment", "Life Cycles" and "Living in Harmony". The resource material was based on a package written by The Whale museum, San Juan Islands, Washington and runs to about 200 pages – a pretty comprehensive read!

Topologika will follow up their Gentle Giant package with supplementary information packs and programs including **Whale Games, Whale Facts, Whales of the North Atlantic, Save the Whale** – Ecologically sound, but it may all be too late to be of any use to save the cetaceans – I hope not.

Contact Topologika at: PO Box 39, Stilton, Peterborough, PE7 3AL. ☎ (0487) 831153.

Disk User – finalist in the 1987 Magazine Publishing Awards

Disk User for the BBC Micro was one of the stars at the 1987 Magazine Publishing Awards. The trailblazing Disk User was the only representative of the computer magazine industry amongst the big guns of publishing.

The Publisher magazine each year chooses a distinguished panel of industry experts to judge nominated magazines in 17 different categories. Disk User for the BBC Micro was nominated in the category of most successful spinoff magazine because it was launched out of sister magazine A&B Computing.

Although only two issues of Disk User had been published at the time of judging, the magazine was runner up in the category. At the Magazine Publishing Awards luncheon on November 11th, guest presenter Sue Arnold of the Observer, handed over the finalist's certificate to Disk User editor Mark Webb.

The judges praised the speed at which the launch was accomplished and were impressed by the "sheer value of the cover-mounted disk that formed part of the new publication's concept".

Archimedes

BEEBUG the recognised Archimedes specialists.

RISC USER

We have launched a magazine and support group specifically for users of Archimedes. The magazine provides news, reviews, hints and programs, while the support group gives Technical Advice and 5% discount on our range of Archimedes products. UK subscription is £12.50 per annum.

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Archimedes 440s are available Ex-stock and 410s will be available in the first quarter of '88.

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0263G Archimedes 440 Entry	2643.85
0264G Archimedes 440 Mono	2701.35
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ARCHIMEDES SOFTWARE

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1081B ISO Pascal	113.85	108.16
1082B Fortran 77	113.85	108.16
1083B Twin	33.35	31.68
1084B Logistix	113.85	108.16
0900B PC Emulator	102.35	97.23
1095B Artisan	39.95	37.95
1096B Image Writer	29.95	28.45
1097B Archimedes Toolkit	39.95	37.95
1098B Alpha Base	49.95	47.45
0640B Wordwise Plus Disc	23.00	20.70
1050B Viewsheets (Emulation)	59.80	56.81
1051B Viewspell (Emulation)	39.85	37.86
1052B Viewstore (Emulation)	59.80	56.81
1053B Viewindex (Emulation)	14.95	14.20
1057B View (Emulation)	59.80	56.81

Trade-In your BBC or Master Series Computer for an Archimedes.

Sample Discounts available:

BBC B issue 7 with DFS	£225
Master 128	£250
Master Compact Entry	£215

Computers must obviously be in good working condition to qualify for this offer.

Please telephone for further details

Beebug are a specialist Acorn appointed Archimedes Repair Centre. If you have any problems with your Archimedes we will be only too happy to put them right.

ARCHIMEDES BOOKS

1242B Archimedes Ref. Man.	29.95	28.45
1271B ARM Assembly Prog.	12.95	12.30

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0267F Floppy Disc Drive	143.75	136.56
0268G 20Mb Hard Disc (300's)	573.85	545.16
0269C Podule Backplane	44.85	42.61
0270D ROM Podule	67.85	64.46
0271D I/O Podule	90.85	86.31
0272D MIDI add-on to I/O	33.35	31.68

The CC ROM Podule from Computer Concepts, features seven 128K ROM sockets which can have Battery-Backed RAM fitted to them. Available End-December.

PRICES INCLUDE VAT

Where two prices are shown, the first is our full price and the second our members price.

ARCHIMEDES LEADS

0558B SKART Lead	10.47	9.95
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0795C 5.25" Archie Disc Lead	25.26	24.00
0796C Serial Link Kit & Disc	18.16	17.25

See next column for details

MINERVA

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1233B Sys. Delta Plus Ref. Man.	29.95	28.45
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0925B Purchase Ledger	64.95	61.70
0926B Nominal Ledger	64.95	61.70
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0929B Reporter	24.95	23.70
0930B Minotaur Game	14.95	14.20

5.25" DISC DRIVE INTERFACE FOR THE ARCHIMEDES

(Available End of December)

Connect up to four external disc drives to your Archimedes with our fully buffered disc drive interface. It fits neatly at the back of your machine and requires NO SOLDERING.

Stock code 0795C Members price £24.00

SERIAL LINK KIT & DISC

(Available End of December)

This kit enables files to be transferred between BBC and Archimedes, in either direction, with the minimum of fuss. The software is menu driven and is fully compatible with DFS and ADFS. The three metre lead simply connects between the serial ports and the software is loaded via the Archimedes.

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0675B 10 x Beebug 3.5" DS Discs	15.79	15.00
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OTHER HARDWARE

0805DCC ROM Podule (End-Dec)	56.35	53.53
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Carriage

Carriage is denoted by the letter contained in the stock code. A-50p, B-£1, C-£2, D-£3, E-£3.75, F-£5.50, G-£7. When ordering several items, use the highest price code and half of each subsequent code. For courier delivery use code G.

Credit Cards

Access and Visa orders are welcome, and may be placed by letter or telephone (24 hours).

BEEBUG LTD,

Dolphin Place, Holywell Hill, St. Albans, Herts., AL1 1EX.

(0727) 40303

Please telephone for a Free Information pack and Archimedes brochure.



Sid Smith explains all to a familiar Eastender.

DABS do it again with MER

Those clever chappies at DABS press have released something called a *Master emulator ROM*. Now obviously this isn't going to be a full emulation of the Master Series machines, but it is a software "enhancement", enabling BBC B+ (or BBC B with Shadow RAM, 1770 DFS etc..) owners to use the commands previously only available on the Master 128 and, to a lesser degree, the Master Compact.

From power up, the ROM is active and it configures itself to behave like a Master 128 – even if you have alien Shadow RAM boards from companies such as Watford Solidisk or Aries.

The only obvious difference between the Master 128 and a BBC Micro equipped with the MER chip is the *CONFIGURE command; For the MER chip, you simply type the configure command followed by the name of the manufacturer of your hardware – for example, if you have Watford's Shadow and

Sideways RAM installed, the MER chip will set the hardware up to accept Master commands instead of Watford's.

A nice feature is that MER also includes a few Master Compact commands – The "I" suffix to the *SRLOAD command is included (this initializes a ROM image loaded into a sideways RAM bank) so you don't have to press <Break> upon loading a ROM – which is a pretty impressive feature for a simple 16K EPROM.

Of course there is an extra command, to reset the machine back to an ordinary Beeb whenever you want to. DABS seem to have done a pretty effective job in turning your Bees into Masters with the minimum of fuss – watch this magazine to find out just how good the product is though – you never can tell with emulators!

The package costs £19.95 for the 16K ROM or £14.95 as a 5" inch disc – 3½ inch discs are available for an extra £2. Contact DABS press at: 76 Gardener Road, Prestwich, Manchester, M25 7HU. ☎ (061) 773 2413.

Commie Parrot time

Silly item of the month now. Welsh computer products manufacturer **Parrot Corp** have just struck up a £4 million deal with The Soviet Union.

Working with Quest Group PLC – these guys are acting as consultants in setting up a floppy disc manufacturing plant in Kiev; when complete the factory will supply over 6 million discs a year to the rapidly expanding Russian market.

It is, of course, idle rumour that each floppy disc will have a digitally embossed picture of Lenin on the sleeve – or that initial purchases of over ten discs will you to a free copy of "What is to be done?" – never mind comrades we'll keep the red flag flying...

New disc plinth from Watford Electronics.

Well what a singularly interesting product this is! And with an exciting name like the DP35 800S, I'm sure everyone is going to remember the name of this product other than "erm... that disc – plinth thingy.."

But seriously folks, Watford Electronics know a good thing when they see one, and this dual-purpose drive is one of them.

Whilst the current standard for the BBC B and Master series is the 5" inch disc, the future standard will most certainly be the smaller, lighter and more compact 3½ inch drives – standard on the Master compact and Archimedes.

So, with this in mind, Watford Electronics have produced a plinth with both disc sizes available, so that you can copy data and programs from the 5" inch format over to 3½ inch with ease.

The plinth has a switched power supply and a 40/80 track switch on the front, you can put a monitor on top of the plinth, and the Beeb underneath, making a surprisingly small footprint, leaving you more room to work with on your desk.

The DP35 800S plinth costs £175 and is available at: Watford Electronics, 250 Lower High Street, Watford, Herts. ☎ (0923) 37774.

Disk User One

Disk User One sold out but is now available as a software product, floppy disc and laserset manual. Order product number DU1. Price £2.95 and £0.50 postage and packing. Order from Reader Services, 9 Hall Road, Maylands Wood Estate, Hemel Hempstead, Herts, HP2 7BH. VISA and ACCESS on 0442 211882.

For Disk User two onwards you can order back issues, price £2.95 and £0.50 postage and packing. Disk User back issues and subscriptions are sent in special packaging to protect your software. Send your remittance to: INFONET LTD, 5 River Park Estate, Berkhamsted, Herts HP4 1HL. Tel: 04427 76661-4 for VISA and ACCESS credit card orders.

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A&B

COMPUTING

Changes afoot – watch out for the new logo in our April issue.

Archimedes gets Teletext

Solidisk Technology, those hardy stalwarts of the Beeb hardware brigade have, after a brief (and some would say unhappy) flirtation with the Atari ST, have bounced back into the world of Archimedes hardware add-ons full of the joys of (ahem) Spring.

Their latest add on unit includes a programmable TV Tuner as well as a Teletext adapter. They are mounted inside their own little box which can be moved from one machine to another a clever idea – and one that will no doubt be copied elsewhere. The adaptor is mains powered and has an aerial input socket and two output sockets.

Why have they put two sockets on the output stage? One output is for connecting to the computer, the other is for connecting to a suitable monitor.

Software is supplied on disc – versions include BBC B, Master Series and Acorn Archimedes. The hardware is compatible with the Advanced Teletext System (ATS) ROM from BBC Enterprises.

The Hardware is interesting in that because the hardware is, in reality, an ordinary TV receiver but without the screen, so you can use your existing computer hardware as a TV screen with software controlled channel selection – but don't tell the boss that at work!

The Teletext section is a standard and very ordinary Teletext decoder with the usual "fast text" facility, enabling users to scan bulk pages and also to download the wealth of Telesoftware available to users of both the Acorn and the Morley Teletext Adapters.

The price is £99.95 including VAT.

Contact Solidisk Technology at: 87 Bournemouth Park Road, Southend. ☎ (0702) 616 818.

Oops... File under blunders

We really must stop meeting like this you know! Four lines of BASIC from the *In Transit* article last month came out wrong because we used a BBC Micro with BASIC 1 to list the program (proving that we do use BASIC 1 for testing out our A&B programs!)

The erroneous lines in Listing 1 should be:

* Insert CRA of listing 1 here *

And in Listing 2:

* Insert CRA of listing 2 here *

To find out if you have BASIC 1 (type REPORT at power up and it should read Acorn 1981) if this is the case – then you will need an upgrade to BASIC 2 in order to use all of the facilities of Beeblink.

Plotmate gets the Domesday option

Users of BBC Enterprises' Domesday system now have a unique way of presenting and storing search data.

The *Domesday Project's* laser disc has access to some 9000 sets of data on the UK and its people. Such information is fairly useful as an educational source, but because the system is generally screen based (ie allowing output to the screen and not to other devices), the software tends to be fairly centered around the software itself.

Well not from now on. Linear Graphics' *Plotmate* plotter for the BBC B and Master series (and versions are on the way for the Archimedes I understand) have developed software to be spooled across to from the Domesday discs to a BBC disc drive, this can be printed off at any time and is a great boon to users wanting to produce displays using this system.

For more information about hooking up the Plotmate Plotter with the Domesday system contact:

Linear Graphics Ltd, 28 Purdeys Way, Rochford, Essex, SS4 1NE. ☎ (0702) 541 663/4/5.



Desktop Publishing packages on the rise – again

Let's face it, if you don't happen to have a mouse on the end of your computer, your machine isn't going to be considered worthy of doing anything these days – which is a shame considering how good some software could be if only it didn't have "that silly WIMP environment in the way".

These days, most computer users have got to have a Desktop Publishing Package for the BBC Micro, even if they don't need one, and the latest one for the Beeb has been released from AVP of Chepstow.

Called "**Pixel Perfect**", this DTP package weighs in as a lightweight package as far as price is concerned – a mere £33.92 including VAT.

Unlike some BBC Micro based DTP packages which are simply copies of other DTP programs from the Big Boys (in the Mac and PC world), Pixel Perfect attempts to make the best use of the Beeb and an Epson printer.

As usual, there are the usual art/drawing routines supplied on disc. In addition to supplying a few esoteric fonts (available separately), a set of *Clip Art* type illustrations are also available, as are some text fonts to add to the standard Roman, Sans Serif and Gothic typefaces.

For more information contact AVP at: School Hill Centre, Chepstow, Gwent, NP6 5PH. ☎ (02912) 5439.

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AB1

More Music from Hybrid Technology

Two more software music albums for the **Music 5000 Synthesiser** have been released. "Notes" and "Music City" are the third and fourth in an ongoing series of disc-based music albums (you load them up and Music 5000 will play them).

Music City is a collection of 12 tracks from Micronet's new Music 5000/Ample User's section of the same name. These include chart hits and some original compositions by Music City's Ian Guinan, these are the first of many pieces available as telesoftware and as disc based packages.

Notes is (are?) the brainchild of Music 5000 expert composer

Pilgrim Beart (Hi Pilgrim!) and is a development of the "Cosmix" album released earlier I haven't heard any of the tracks yet, but things are looking good good good for the Music 5000 system – keep an eye out for reviews of their advanced music software available soon.

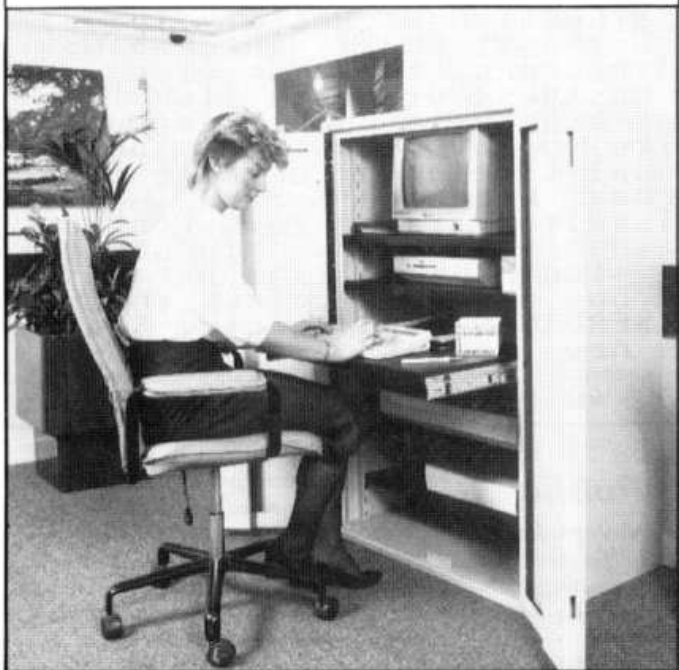
Notes and *Music City* both cost £4.95 each, as do the first two albums, *Cosmix* and *AMPLE Bytes Back*. They are available from Hybrid Technology Ltd. Unit 3, Robert Davies Court, Nuffield Road, Cambridge, CB4 1TP. ☎ (0223) 316910.

● As a postscript – has anyone seen Peartree's "Music 87" yet? Perhaps they had better call it Music 88.. or 89 or hey – Music 90, now that's a nice round figure!

Portastor stops office theft...dead

Just enough room to squeeze in this latest ditty from Portastor... (yes the people who make the portaloos), who have made the ultimate security convenience (oops sorry). This great big beast can digest a micro and all of the associated cables inside a secure locker which, can be used as a workstation and a storage cabinet.

The units start prices at £495 and go up to £565 for a large model – price includes delivery, installation and bolting to the floor for added security. This is out of reach for most home owners but it is ideal for schools and businesses who have invested a lot of money in a single computer system.



Master Internal Modem

Those enterprising chaps at **Beebug** have got their act together and are launching an internal modem for the Master 128.

The Beebug modem has been given the Acorn stamp of approval so I am told – it costs £119 including VAT and can be fitted in a matter of minutes, requiring no soldering whatsoever.

The modem features V21 and V23 baud rates (that's Prestel/reverse Prestel and the slower 300/300) which is ideal for Micronet and most of the more general communications services.

Logo taped

"Everything you wanted to know about LOGO, but didn't like to ask" is how Logotron present their case for the programming language they have single-handedly developed into a fully fledged educational programming environment for the BBC Micro.

Under the eminently pretentious title of "LOGO comes of age", this audio cassette is aimed at LEA advisors, advisory teachers, inspectors, teacher trainers, educationalists, politicians and journalists (thanks guys).

The tape sets out to inform the listener about the history of LOGO, LOGO's "internationalism", who uses LOGO LOGO's and secondary school applications...

The tape is "sort of" public domain, so you can make multiple copies for other schools, teachers and so on without any worries from copyright infringement – but then why should Logotron worry? It's their program you are spreading the word about!

It seems that Logotron are serious about LOGO – their Archimedes implementation is almost with us, and to be honest, I wish my first experience of computer programming was with a turtle (or at least a mouse) – listen to the tape and see why.

If you fall into the target area, why not request a tape, or ask a teacher to order one? Contact Logotron at Dales Brewery, Gwydir Street, Cambridge, CB1 1BR.

DABS PRESS

New products for your BBC Micro...

SideWriter by Mike Ginns

A pop-up memo pad for Sideways RAM owners (B/B+/Master) which can be called at any time by pressing CTRL-SHIFT-TAB, and after use returns to the main program. The pad is a large 128x76 page with a scrolling screen window. Co-resides with just about anything even games! Works with any brand of SRAM. £7.95 disc.

MOS Plus by top BBC programmer David Spencer

Provides *FORMAT, *VERIFY and *BACKUP in ROM, a complete Alarm Clock system (uses Clock chip alarm facility), fixing of DFS *CLOSE bug, single drive backup using SRAM, use AMX Mouse without their ROM and much, much more. £12.95 ROM (£7.95 disc)

Master Emulation ROM also by David Spencer

Gives you virtually all the software features of a Master 128 on your BBC B/B+. Full spec. on request. £19.95 ROM/£14.95 as Sideways RAM disc. Free assembly language book worth £8 with every order.

Other Dabs products available now...

Master Operating System: A Dabhand Guide	£12.95
"indispensable" A&B Computing	
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Fingerprint Machine Code Monitor	£9.95
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Assembler Bundle - two books, two discs 90 programs	£9.95

Coming soon...

HyperDriver Printer Control ROM • ViewSheet book • "C" book

Prices inc. VAT and p&p in UK. ACCESS/VISA accepted by post/phone. Products also available from good dealers. Full catalogue free on request. Add £2 for 3.5" discs. Add £2 per order if outside UK. Official and trade orders welcomed.

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ON LINE

Dave Somers presents another monthly roundup of all that's happening in the comms scene

MicroLink's £1.3 Million Deal

A massive expansion of MicroLink, Britain's fastest growing electronic mail service, is now being planned following the completion of a £1.3 million contract with Telecom Gold.

The agreement was signed by MicroLink chairman Derek Meakin and the general manager of Telecom Gold, Clem Jones.

MicroLink was launched in April 1985 as a means of encouraging users of microcomputers to start exploring the exciting new world of electronic communications.

It became an instant success, not only in Britain but in Europe, the Middle East and Australasia, as people all over the world found out how easy it was to couple their micro to the telephone to create instant links with people many thousands of miles away.

The MicroLink service is housed on a Prime 750 computer in Telecom Gold's top security London headquarters. As part of the new deal the service is this month being transferred onto a computer that is four times more powerful – the Prime 9955.

Said Derek Meakin: "The phenomenal development of MicroLink has meant that we have now outgrown the computer that has served us so well in the last two and a half years.

"The new machine will give us much greater flexibility. It will allow us to provide a much faster service, introduce a variable

charging structure to meet the different needs of our users, and make possible the installation of many new and exciting facilities."

Starting with a basic electronic mail service, MicroLink has pioneered the creation of a wide range of services.

One is a unique link between MicroLink and the Post Office, allowing a user to type out a letter on his keyboard which can be delivered by the postman the following morning to any home in Britain or the USA.

The electronic letter is transmitted in seconds to the postal delivery office nearest the recipient, where it is printed out exactly as it was typed on the computer and then put into a distinctive gold and blue envelope ready for delivery.

MicroLink has also opened electronic gateways to vast overseas databases. One is to a computer in New York, through which MicroLink subscribers can be instantly connected to leading electronic services in the USA.

Another is to the EEC's communications headquarters in Luxembourg, where users can key in to the biggest dictionary in the world – a multi-lingual computer containing

more than 400,000 words and phrases in eight European languages, and which is being added to at the rate of 2,000 words a month.

Said Derek Meakin: "We have lots of ideas for developing new services on MicroLink, from opening many more international links to creating novel teleshopping opportunities.

"We also intend making the most of the enormous number-crunching capabilities of the new MicroLink computer to enable our subscribers to turn their home or business micro into a terminal that can tap the tremendous power and versatility of a mainframe computer."

Telecom Gold's head, Clem Jones said: "We are delighted with the progress of MicroLink, as an important distributor for TG's Email service. It has been able to bring electronic mail to the computer enthusiast by providing a number of value added enhancements for this important sector of the market.

Telecom Gold has had a successful relationship with MicroLink for two and a half years and this new contract consolidates the relationship."

1a
22:24 Op



[Main Index](#)

- 1 GENERAL INTEREST News, Weather, Travel
- 2 EPNIMAIL National EMail, autopaging, user directory, telex services
- 3 EPNILINK business videotex link for instant branch to branch commun.
- 4 ASPECT Cityline 800, ELaw, Companyfile
- 5 YAPSPOT real-time open forum letters; Letterbox, Free ads & more
- 6 MICROROOT editorials, reviews, features downloadable software, Microboard
- 7 EPNIDISK student & college databases
- 8 CATALOGUE business & services index
- 9 CUSTOMER SERVICES Guide, Join, Scale, Whats new, Advertise, Contact us

*G Guide
*Q Quicklook at some areas

Epnitex Goes Public

Eleven months after its initial production announcement, Timeframe Epnitex plc launched on 11th November a public videotex service designed to rival BT's Prestel system.

Said chairman, Roy Norman "We were

reluctant to launch Epnitex earlier this year when it was structured and ready. Instead we took the decision to wait until there were sufficient user refinements added to leave the competition behind; written to a standard which others would find most difficult to incorporate in the future". He added "One very major advancement is the ability for

readers' screens to automatically update if information is changed. In the past such an advanced ability has only been available on private-wire systems, like the stock exchange. This facility has been built into each of the 1 million pages which Epnitex is capable of handling on behalf of companies wishing to display information".

There are several levels of membership with varying prices and facilities. Business subscriptions cost £5.77 per week paid annually in advance, and permit 24 hour access. Educational subscriptions cost £2.40 per week paid 6 months in advance, and permit access from 1pm daily until 8am plus weekends. Domestic subscriptions cost £2.40 per week paid six months in advance, and permit access from 6pm until 8am plus weekends. Student subscriptions cost £2.40 per week paid three months in advance, and permit access from 6pm to 8am plus weekends. The domestic and student subscriptions do not allow access to business CUG (closed user group) memberships.

In addition to the above subscription charges, there is a five pence per minute time charge. However, business users get five minutes per day free, with other users getting 15 minutes per day free.

For further information contact:

● Timeframe Epnitex plc on Telephone 0526-861138, Telex 56420 TIMEFM G.

InterSpan successfully completes trials

InterSpan Electronic Mail have just completed user trials of their new electronic mail service. After more than three months of testing and improving the system, they are confident that they are ready to start the full commercial service. Kim Spence-Jones, the research director of InterSpan explained "We have just approved a new version of the software with major enhancements. Many of the features we have added have been suggested by users at the trial sites. The service is now at least equal to other mail services in most of the facilities offered, but we are still developing new features all the time".

InterSpan is a nation-wide electronic mail system designed specifically for use in education, and it is also one of the first systems to comply with the new X.400 international standards for electronic mail.

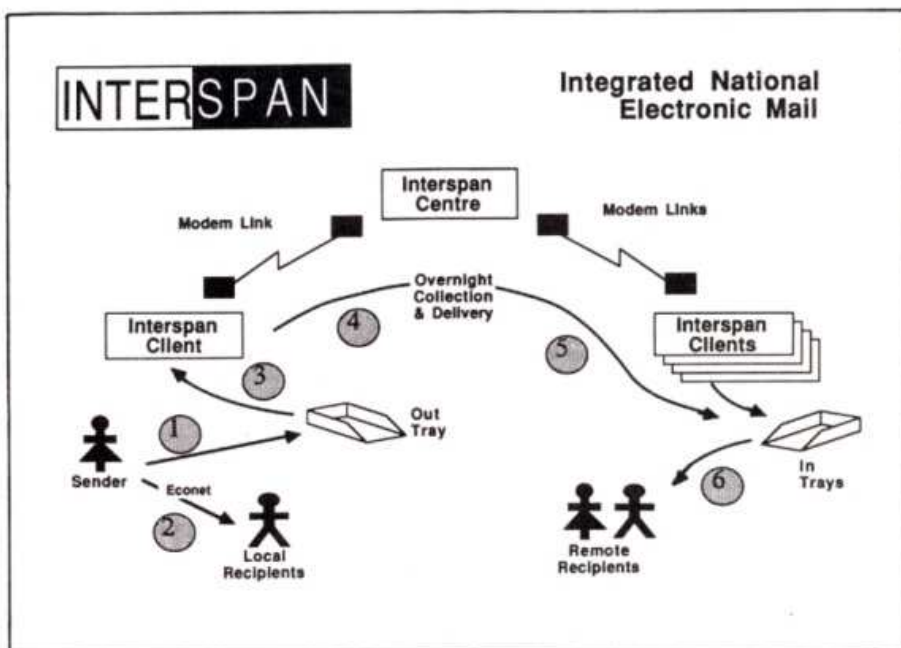
One of the great advantages of InterSpan is that it is based on the concept of moving data as files, rather than just text. Amongst other things, this means that InterSpan can afford to distribute regular software upgrades, using the service itself.

Further information on InterSpan can be obtained from:

● InterSpan Electronic Mail Limited, 108 Mill Road, Cambridge CB1 2BD. Telephone 0223-316686, Telecom Gold 87:CQ061.

Contact!

If you have any ideas for topics that you would like to see covered in this column, or



perhaps an idea for an article, then jot me a line giving a brief outline. Please remember, that this column is for **you**, and as such, any input from you is always most welcome. Any comments and suggestions should be sent to me at the below address by snail mail or e-mail (preferably via Telecom Gold (Dialcom)).

If you have any problems communicating, then contact me and I'll try and help you out. New sysops who would like details of their board to be mentioned should also contact me, giving full details of their board and, if possible, a voice telephone number.

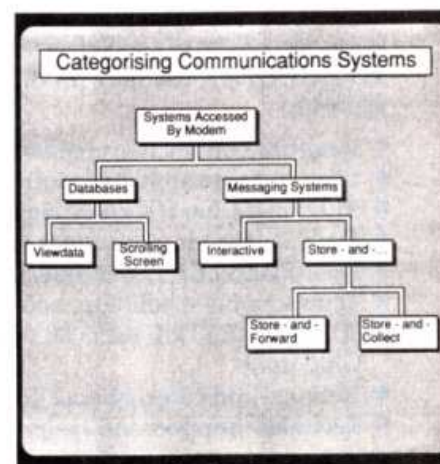
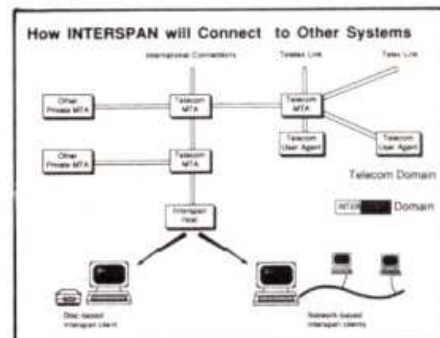
Any appropriate press releases are always most welcome and should also be sent to me at the usual address.

I can be contacted by:

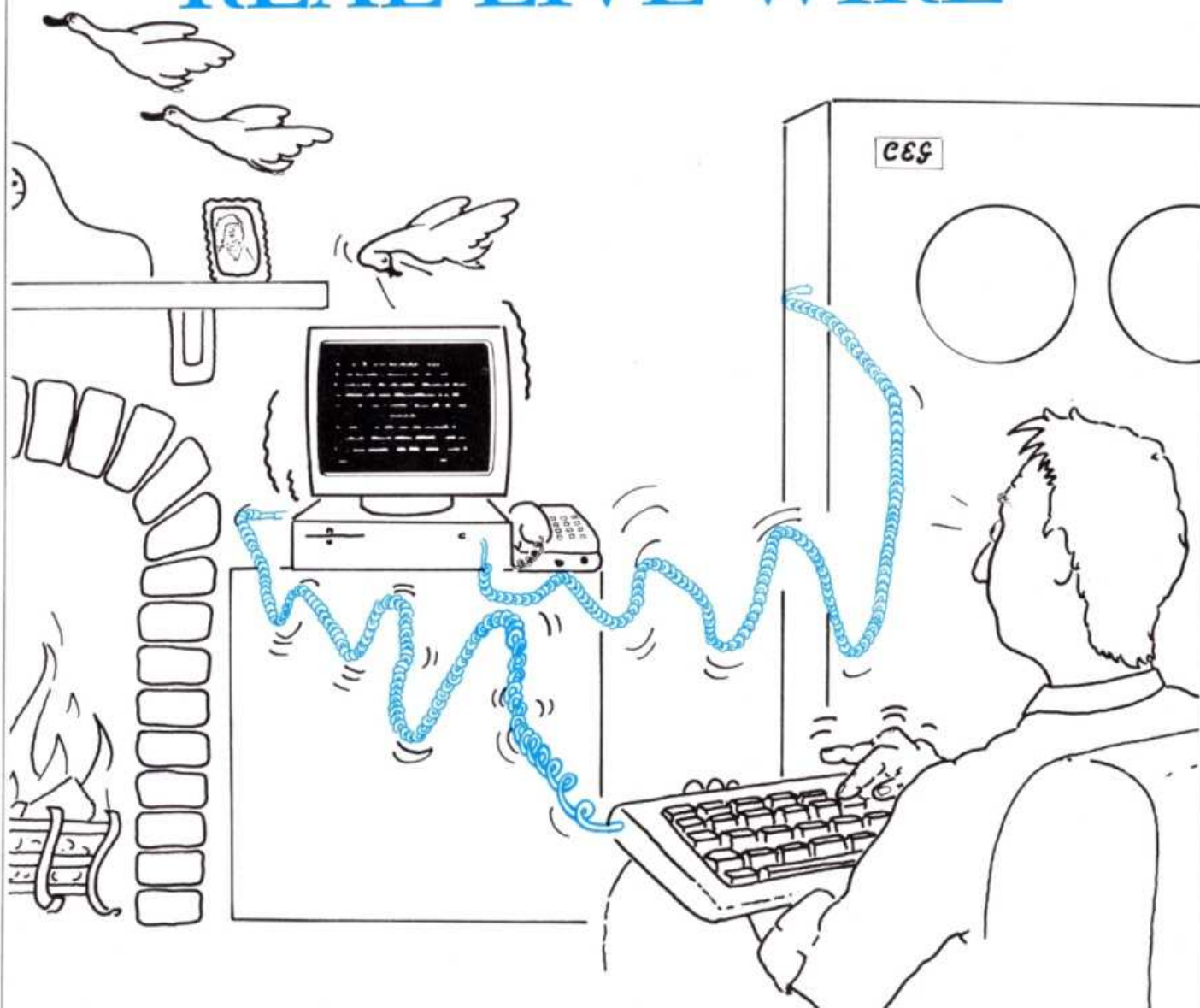
- 1) writing to be by snail mail at, Dave Somers, OnLine, A&B Computing, Argus Specialist Publications Limited, Number One Golden Square, London, W1R 3AB.
- 2) Telecom Gold (Dialcom) mailbox 72:MAG11090
- 3) Prestel mailbox 819990565
- 4) EpnMail mailbox 868396
- 5) Telex 265871/265451 MONREF G, Attention 72:MAG11090
- 6) InterSpan. Send messages to organisation: DAVE SOMERS.
- 7) via Sirius BB, on 01-542 3772, online Saturdays 1900-0200 hrs, Sundays 1200-0200hrs, and Mondays 1900-0200 hrs. Please observe these operating times!
- 8) via Mektronic Consultants Computer Line on 061-773 7739, 24 hours a day. (At the main menu type **MA14** to take you straight to the A&B messaging section.)
- 9) via Swafax 3 on telephone 0622-858304, 24 Hours a day, 1200/75. NB. viewdata software required.

Please remember that whenever references are made to databases, it should be assumed that they operate at 300/300 (V21)

and 1200/75 (V23) with 8 bit data word, no parity, and 1 stop bit (8n1), scrolling ASCII (TTY) terminal software required, unless otherwise stated.



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THE

ARCADE

**Another month,
another pile of
goodies slipped
into the disc drive
where the big guys
disappoint and the
budget releases
please**

Welcome!

It only seems a couple of weeks ago that I was writing the last Arcade – are you sure this magazine isn't appearing twice a month these days?

So what have I to report this month? Well, mainly the lack of a whole host of games that are lost somewhere in the postal service! Still, that should make for a bumper selection next month.

Meanwhile we have a few games to play, a popular choice for Programmer Profile (take a bow, Kevin Edwards), the start of a new game diary with the intriguingly named *Repo Ball*, some hints, some wings and a fair bit of industry gossip and news. The biggest disappointment this month is the fact that my Beeb hangs up on the supplied at the last minute exclusives – Domark's *Star Wars* and Superior's *Bonecruncher* Aarggh! However, next month's reviews will still probably beat the competition!



Game of the Month!

**Winter Olympiad 88 – Tynesoft –
Model B/Compact/Electron – Tape/disc
£9.95/£14.95**



**Graphics/sound 8 – Playability 8 – Originality 8 –
Options: 1-4 Players & Sound Skip events Value for
money 8 – Lifespan 9 – Overall 8**

This was a hard choice – regular readers will know my aversion to sporting simulations but this time Tynesoft have produced a winner. Just as well really as they've also released it for just about every machine around.

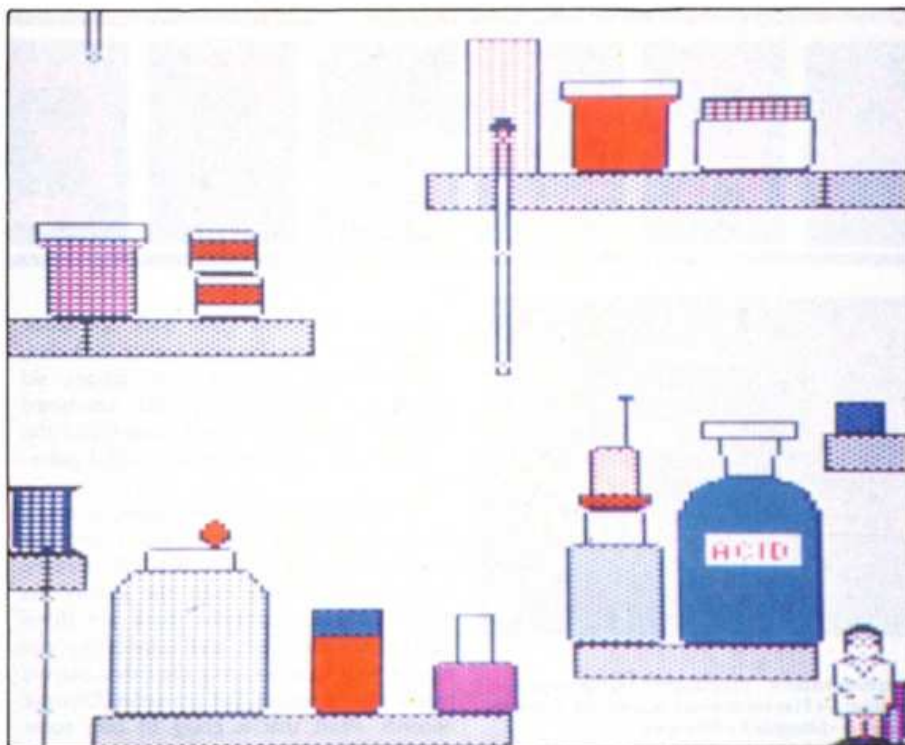
The Acorn versions, coded by Dave Croft, are much more than simple updates or enhancements of Tynesoft's earlier *Winter*

Olympics. Dave has gone back to basics, coded some intriguing new events (bob sled, speed skating, ski jump, giant slalom, ski slalom and biathlon) and then combined excellent pseudo-3D graphics with just the right amount of addictive and skillful game-play.

As with many Tynesoft games, it opens with an excellent title screen (must get around to picking the ten best title screens some day...), leading onto the events. As usual in these simulations there are three heats for each event and (obviously) you must try to beat not only the other players and/or the computer, but the actual Olympic records. Well, that is going to take some time.

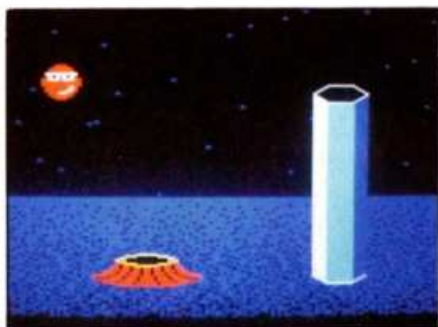
Some problems remain – a common Croft problem seems to be a bit of colour spill caused by windowing sections of the screen for different mode graphics, I suppose. I remember it well in *Phantom* and it's noticeable here, especially in the bob sled (should that be sledge?) where a small





overhead map of your progress bottom right of the screen changes colour half way down the window. But this is really just a minor winge – the graphics on the whole are stunning with a real sense of distance and movement. Nice human touches too – the speed skater is especially well animated and the shooter in the biathlon is nicely detailed.

Quite simply – the best sports simulation I can recall for quite some time and, with the inclusion of an introduction in the booklet by David Vine and a simple competition (closing date: 30th January 1988) with a great prize of a trip to Calgary for the real Winter Olympics, this should be considered very strongly even by those (like me) who usually dislike these simulations.

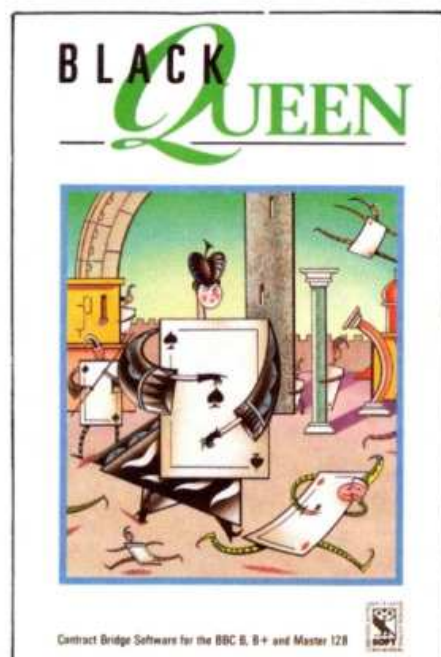


Interesting too to see Tynesoft taking a long time to get the game right (even to the extent of delaying all their other autumn/winter BBC releases) and being forced to raise their prices on this one game – to pay for the prize obviously.

And, for those unable to enter the competition, we have our own Arcade competition. There is in the game, a simple

mistake (*not* a bug) which I spotted at once on the sample video demo for the game. The first person to contact The Arcade with the right solution gets their choice of any three Tynesoft games – *Spy Vs Spy*, *Phantom*, the forthcoming *Inddor Sports* or *Boulder Dash*, *Commonwealth Games*, whatever.

Finally, lads, before I get into another argument with you about scoring – remember I'm bound to mark down sports simulations. Still, despite that, this is a game that I've played with very real pleasure.



Black Queen

BBC Soft Model B Disc £14.95

Graphics/sound 7 – Playability 8 – Originality 7 – Options: none – Value for money 8 – Lifespan 8 – Overall 8

Let me say right up-front that I'm not a bridge player – all that complexity of bidding conventions has always been enough to put me off. However, without reading the excellently detailed and simple manual, I managed to sit down and play a reasonable hand first time out.

Obviously aiming to be the *White Knight II* of the bridge world (watch out for CDS' *Colossus Bridge* due next year), I reckon they've got it about right. The program plays an Acol variation and should give most bridge players a good game whilst offering the beginner a useful teaching aid.

The other thing that annoys me a little, however, is the way that it redraws your entire hand after play of a card – very time-consuming and the graphics of the cards are not as crisp as they could be.

This makes a nice change of pace from the usual game releases – try it out; I think you'll be as impressed as I am.

Elixir

Superior/Acornsoft Model B/Compact/ Electron Tape/disc £9.95/£11.95/£14.95

Graphics/sound 7 – Playability 6 – Originality 8 – Options: pause, sound – Value for money 7 – Lifespan 6 – Overall 7

Oh dear, a real disappointment from Superior this time and, having been expecting this one for quite a time, I was hoping for a real classic.

Written by Richard Williams, John Llewellyn and Chris Hyde (committees are often not the best solution) the game involves a series of puzzles set over 40 screens of 'hilarious chemical capers'. Briefly, you are a scientist shrunk to the size of a bottle of pills and have to negotiate shelves of chemical apparatus to regain the growth formula. So far, so tedious.

The action and graphics are flat, with a neat redeeming feature of pixel-hatching to create a very colourful game. As you negotiate the shelves you must collect 40 vitamin pills as well as a series of objects for puzzle solving. A fair bit of time is spent working out which pills are good and which are not, but a bit of quick mapping soon sorts that out.

Careful planning allows you to reach seemingly inaccessible places by climbing bottles of different heights, often far away from where you want to end up. It's not that the game is difficult, more that it doesn't really inspire.

Pity about that. There's evidence here of some crafty programmers at work and the shame is that they've created a game with all the right ingredients except the most important – does it draw you back to play again and again. I've had to, of course, in order to write the review but somehow I don't see myself returning to it again.

Joust About!

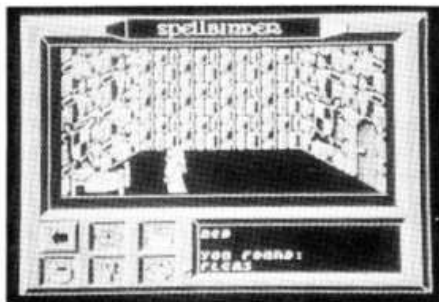
Skirmish Top Ten Model B/Electron Tape £2.99

Graphics/sound 8 – Playability 8 – Originality 7 – Options: 1-2 player – Value for money 9 – Lifespan 8 – Overall 8

If you've still got a copy of *The Arcade* for October 1986 then dig it out and read my review of *Joust*, that month's Game of the Month. Delos D. Harriman's superb conversion of the arcade classic had a fairly checkered history up to that time (coded for AtariSoft who never released it, semi-released by Aardvark Software who never sorted out the copyright problems, sold mail order by Harriman, etc) but, at last, we have a proper release from new software company Top Ten.

If you've got the program already (and you should have!) then this is identical except for a new title screen and the existence of the all-new Elk version.

If you haven't then please do search this out at once – even if you've never played the arcade original, you can't fail to be captivated by the jousting men on the back of birds, the Larva Troll and the other monsters, etc etc. It's simple to play, very addictive and a very very classy piece of programming. If it wasn't a rerelease it might even be Game of the Month again but, for this budget price, this has to be an essential purchase this month. Trust me!



Spellbinder

Superior/Acornsoft Model B/Compact/Electron Tape/disc £9.95/£11.95/£14.95

Graphics/sound 7 – Playability 8 – Originality 7 Options: sound, pause – Value for money 7 – Lifespan 7 Overall 7

This just isn't Superior's month! What could have been another superb 3D arcade adventure is let down by some of the slackest graphics I've seen for some time in this gaming sub-genre.

Coded by Dan and Elan Shirron from Israel, the game combines elements from several classic Ultimate arcade adventures – the familiar diamond shaped rooms, the chunky graphics, the creations of spells from collected ingredients, etc – not to mention the feel of *Imogen* about the place. However, where *Ultimate* stunned us with incredibly busy screens, amusing graphics with lots of detail and lots of speed, *Spellbinder* just falls short.



The graphics look excellent as black and white screen dumps, but in movement, they are not impressive – the central character Eldon seems to scoot around on wheels – no feet, no leg movement, no realism. Some of the detailing of the castle is impressive but far too much of it is repetitious.

However, as if recognising the game's flaws, Superior are plugging away the puzzle angle and they are right to do so – the game involves a lot of searching and trial and error mixing of various magical objects discovered en route. What noxious mixture will keep away the Forest Hag or the Winged Skull?

One excellent feature of the game is the icon game controls, featuring searching, spell mixing, using objects, etc. Oddly the icons are controlled by the function keys which feels a bit odd (cursor control would have been my choice) but their presence here does raise my expectations that there may be more to this game after repeated plays.

However, my initial reaction was to curse the non-loading early preview of *Bone Cruncher* – early exposure to that would have restored my faith in Superior, in arcade adventures and in the search for excellence. And *Spellbinder*? I suggest you try and see it in action before you buy it.

Countdown

TV Games (Domark) Model B/ Tape/Disc £7.95/£12.95

Graphics/sound 7 – Playability 7 – Originality 7 – Options: 1-2 players – Value for money 7 – Lifespan 8 – Overall 7

Domark have just rereleased a whole series of TV game show conversions, originally released by Macsen that were meant to slip out into an unsuspecting world. I'm always suspicious when review copies aren't supplied but, after special pleading resulted in this one game of the series, that suspicion soon vanished.

This isn't flashy. You won't want to play it every night. I'm not going to be inundated with pokes for it. But it's a good, solid little game with much to commend it – a reasonable adaptation of the semi-cult daily show which, thankfully, omits Gyles Brandreth. If you've never seen the TV show then don't worry – it's basically Scrabble against the clock as you have 30 seconds to create the longest possible word from a selection of nine letters or else work to a final figure from a selection of numbers.

The only real flaw with the game is the absence of a very large memory to hold the dictionary, although it is surprisingly comprehensive. It allows the other player (or yourself if you're alone) to verify that a word exists and doesn't check, for example, that six consonants in a row do not exist in the English language. A minor point, not easily remedied.

I never saw this game in its original release, thinking that it might be dire. After playing *Countdown*, I'm eager to seek out the others in the series – *Treasure Hunt*, *Blockbusters*, etc.

Bar Billiards

Blue Ribbon (CDS) Model B/Electron Tape £1.99

Graphics/sound 7 – Playability 6 – Originality 8 Options: sound, 1-2 players – Value for money 7 – Lifespan 6 – Overall 7

Those old MRM classics roll along for ever, it seems. I've lost track of the number of rereleases this simulation has enjoyed but it is basically a good game that can still be played with pleasure.

Bar billiards is obviously not the same classic game as snooker (track down CDS' Steve Davis tie-in for the best version of that) but it's good fun and, at the price, worth looking out for.

Can they release it again? Well, possibly – on the projected disc compilations, perhaps?

Trapper

Blue Ribbon (CDS) Model B/Electron Tape £1.99

Graphics/sound 7 – Playability 8 – Originality 7 – Options: sound – Value for money 8 – Lifespan 7 – Overall 7

A great little budget item here – a kind of *Pengo* variant with our hero being chased around the screen by nasties. Can he shift blocks into position, thus trapping and squashing the baddies? Well, with six levels of difficulty and increasing numbers of nasties on each level, it's not always easy.

It is always fun, however. The graphics are adequate for the gameplay which, although derivative, is exciting and compulsive. A simple idea that works – partly because the game recognises its own limitations and partly because it is a model of an excellent budget game. More of these please, Blue Ribbon!

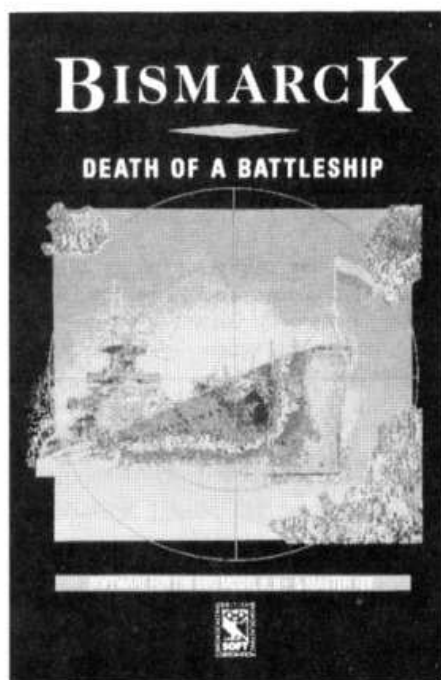
Bismark

BBC Soft Model B Disc £14.95

Graphics/sound 8 – Playability 8 – Options: 1-2 player Originality 7 – Value for money – 8 Lifespan 7 – Overall 8

We've looked in these pages over the last few months at a number of war game simulations – I'm no expert but even so I've been impressed with the quality.

This simulation by Barry Joyce does seem to be aimed at rather a different market, however – the expert wargamer. A large program covering the North Sea and eastern



Atlantic, it offers levels of complexity that I haven't even begun to touch after some hours play.

I know when I'm out of my depth – the excellently produced manual even has a reading list! This is a game for long study and those at home in the world of wargaming should leap upon it. Beginners too could try jumping in feet first – the manual is clearly written and takes you through a sample game but this is clearly a program of a very high standard that will repay a lot of study and practice.

It's a bit intense for me, but I know a classy piece of work when I see one. Good to see BBC Soft back as well.

Return of R2

Blue Ribbon (CDS) Model B/Electron

Graphics/sound 5 – Playability 6 – Originality 5 – Options none – Value for money 6 – Lifespan 4 – Overall 5

Another new title from Blue Ribbon, whose release schedule has a nice balance of rereleases and fresh games. However, a combination of cover artwork that suggests a Peter Scott game and a gameplay that owes everything to Ultimate's *Alien 8*, except in the crucial areas of talent and graphic detail, makes this the least appealing of the month's releases.

Using that old familiar pseudo-3D, diagonal rooms with lots of doors, plenty of objects that kill on contact, etc that characterised *Alien 8*, the idea is to explore a space station to collect energy before time runs out. The detailing (hah!) of the graphics is non-existent to the point of insulting, the animation is poor, the room structures are poor copies of Ultimate's originals and the game does not inspire you to play on.

Steer clear of this one – it won't make it to the Dodgy Dungeon but with the original

Ultimate 3D arcade adventure classics now available on budget format there is no need to divert your attention this way. Great pity, Blue Ribbon – you've always done better than this and your budget titles have long been models of value for money software. This game does nobody any favours.

Video Card Arcade

Blue Ribbon (CDS) Model B/Electron Tape £1.99

Graphics/sound 6 – Playability 7 – Originality 6 Options: none – Value for money 7 – Lifespan 6 Overall 6

I'm sure that this is a rerelease too, so we'll keep the review short. Simple simulations of poker, pontoon and high/low hold the interest and, whilst the graphics aren't going to win any awards, it's all competently done.

Card games seem notoriously difficult to code in an interesting way, but this represents good value for a budget label and will keep you amused. I just wish that I could remember when it was last released!

Programmer Profile

Tracked down at last! One of your more frequent requests to The Arcade was for a profile of Kevin Edwards, whose *Galaforce* from Superior last year was a great favourite.

Well, good things come to those who wait and, after bumping into Kevin at a recent show, he agreed to put himself in the spotlight and reveal his innermost self. Not to mention admitting to a couple of relatively unimpressive early games! Just remember, Kevin, confession is good for the soul.

So, Kevin Edwards, software programmer and protection expert, this is your life – "I first became interested in microcomputers when I started computer studies at school. All of my early programming experience was on the school's Commodore PET – 8K RAM, cassette storage. About a year later I was bought a Nascom 2 (A British made 32K RAM kit computer). I wrote many programs on my Nascom and soon learnt Z80 machine code and hand assembled my own arcade style games – none of them were ever completed as I kept moving onto new ideas.

"Over the next few years I saw the arrival of the Commodore VIC 20, C64, Spectrum and many others. Nearly all of these new micros were capable of colour graphics and sound. However, I resisted the temptation to buy any of them until the arrival of a new Acorn micro. I saved up and eventually bought a BBC model A. This was soon upgraded to 32k RAM with User VIA so I could play the early Acornsoft games – *Planetoids* mainly. I still use this micro to write games on.

"After learning BBC BASIC, I progressed to 6502 assembler, which I knew a little about from programming on the PET. During this period I had a break from programming

because of my 'O' levels.

"I stayed on at the same school to take my 'A' levels, computer studies included. During 1983 I played around with lots of ideas and programming techniques – on the BBC – and didn't really get my teeth into any real projects.

"During the summer holidays I was offered a 6 week job at Optima software writing BBC programs. It was there that I wrote *Optimon* – a simple machine code monitor – and *Atomic Protector* – a maze game similar in concept to Pacman. Both programs were marketed but didn't sell very well.

"The following summer – right after my 'A' level exams – I worked for Database Software on a program called *Micro Olympics*. I joined near the completion of the Spectrum and Commodore 64 versions. After this experience I decided that I was much happier working with the BBC Micro than the Spectrum or C64.

"A few weeks later I was offered a full time job in the editorial department of The Micro User/Electron User. I spent the next 18 months with Database publications and learned a lot about the BBC Micro and met many other BBC programmers and enthusiasts. During my spare time I used to write protection systems for several software houses. For some strange reason I found this fun as well as rewarding. I protected many games, including *Knight Lore*, *Alien 8*, *Wizardore*, *Beach Head*, *Yie-Ar Kung Fu*, *Match Day*, *Lunar Jetman*, *Nightshade*, *Stryker's Run*... etc

"By early '86 I had decided that I wanted to concentrate more on programming and hoped to get some of my own software published, so I decided to take a risk and leave Database to become a freelance programmer.

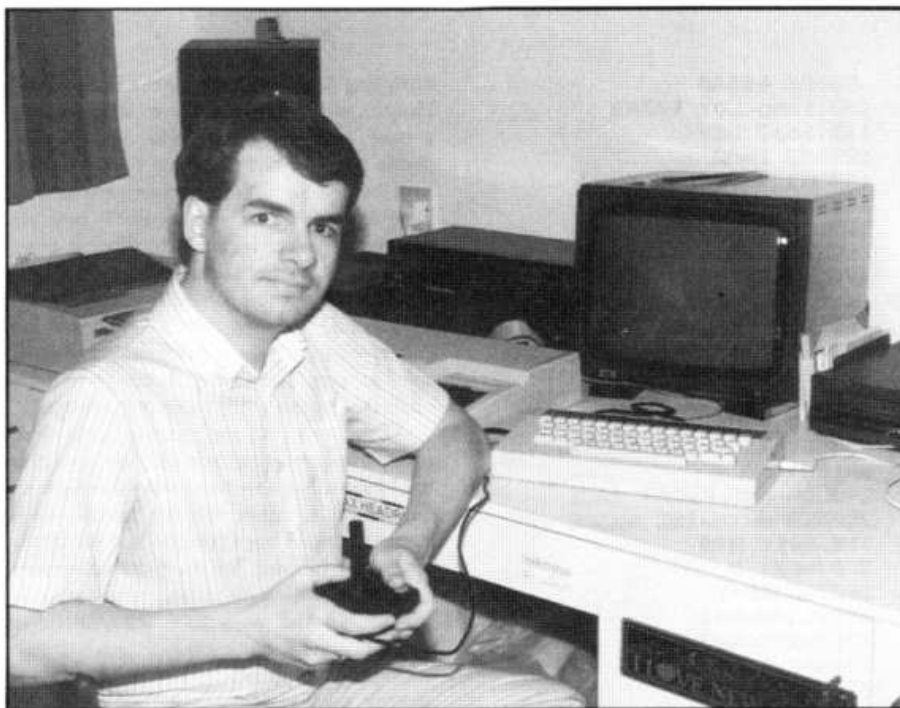
"Everything went well and in September '86 Superior Software published BBC and Electron versions of my shoot 'em up game *Galaforce*. It didn't quite have the same impact as *Elite* when it was launched but received many excellent reviews. I was very happy with the royalties I received and started looking for ideas for my next game.

"My next project was *Crazee Rider*, a fun motorcycle racing game in which you compete against other riders at famous race circuits. This shot into the top half of the BBC software charts immediately and is still selling very well.

"I like to keep my future project ideas as secret as possible. For the immediate future I can see no reason why I won't be writing BBC and Electron games. There may also be an *Archimedes* game in '88 if the market grows enough."

Kevin Edwards BBC/Elk History

1983 *Atomic Protector* (BBC) 1983 *Optimon* (BBC) 1986 *Galaforce* (BBC and Electron) 1987 *Crazee Rider* (BBC, Electron and Master enhanced) 1988 ?Who knows?



On the Spot with Kev

That's the official Edwards story but what about all of our unanswered questions? Don't be impatient, we're on the case.

Tell us about the cheat modes in your games.

I have not put any cheats in my games to date.

Okay then, what about unfinished or unreleased gems?

All but one of my unfinished projects didn't get past the 2nd week of coding. The exception to this was a 1983 BBC Micro game called *Storky*, a sideways scrolling game in which you controlled a stork who bounced a basketball! The graphics by Chris Roberts were very good in 1983 but are ok by today's standards. *Storky* was abandoned after a couple of months for no apparent reason. I might use the idea for a future game if I can bring the game scenario up to date.

What equipment do you use?

I develop my games on a Master 128 with second processor. Graphics are now created on an Archimedes using my own sprite editor module written in August '87 - my first Archimedes program.

Why, with your talent, have you written so few games?

I tend to write games at a slow pace and spend more time thinking about how to do things faster and smoother. I find that rushing any piece of software results in bad coding, unless you know exactly what to do from past experience.

What then is the easiest part of your job?

The hardest part in writing a game is coming up with an original idea. The programming is the easy bit - assuming there's enough memory.

And your favourite games?

I don't have a favourite game as such. Very few games keep my attention for more than a couple of minutes nowadays. Arcade games such as Out Run are great to watch, but unfortunately a good micro conversion of them is impossible.

And finally, Kevin, what about some hard biographical info?

What? Must I? Okay, then. Name: Kevin J.T. Edwards. Age: 21, single. Occupation: Freelance programmer. Home Address: Altrincham, Cheshire. Interests: Computing, amateur radio, music, role playing games and reading. Likes: Humorous films, the ARM, Ferraris, Mission Hi-fi equipment (good man! - Ed.), Tenerife, the 'Old Orleans' restaurant in Cambridge. Dislikes: Smoke filled pubs, noisy discos/clubs and 'trendy' people.

Thanks Kevin. And now for some cheats since Mr Edwards is not kind enough to include cheat modes!

A couple of quick pokes for *Galaforce* - *LOAD GALA3 then enter ?&ID45=(level: 1-128) to start on any level (this can have strange results!) or ?&IC9B=&EA:&IC9C=&EA:&IC9D=&EA for infinite lives. For both then just CALL&4000.

Onto to *Craze Rider*. Firstly, anyone with 16K of sideways RAM installed in banks 4, 5, 6 and 7 (eg the Watford ROM/RAM board with 128K of RAM) can play the enhanced version by pressing '2' on the title page.

For comprehensive cheating, type in Listing 2 by Richard Koten of Harrow, Middlesex. First, load the menu and delete lines 10, 60, 170, 260 and then type RENUMBER 50,10. Type in the listing, save it as CRAZEE and then run it.

```

10REM *** CRAZEE RIDER ***
20REM *** POKES BY ***
30REM *** RICHARD KOTEN***
40IF PAGE>1200 THEN PAGE=&
1200:CHAIN"CRAZEE"
150 MODE3
160 PRINT"1) NORMAL VERSION"
"2) ENHANCED VERSION"
170 G$=GET$
180 IF G$="1" THEN PROCnormal
1
190 IF G$="2" THEN PROCenhanced
200 GOTO 170
210 DEFPROCnormal:PRINT"NORMAL VERSION"
220 PROCNumbers
230 *LOAD MODULE
240 *LOAD GAME
250 ?&499=&60:CALL &400
260 ?&1A7D=QX:&1DFB=SX:&1FB6=
CX:CALL &664B
265 ENDPROC
270 DEFPROCenhanced:PRINT"ENHANCED VERSION"
280 PROCNumbers
290 *LOAD MCRmod
300 REM Replace next four lines with correct commands if you're not using enhanced version on a Master
310 *SRLOAD MCRsr4 8000 4
320 *SRLOAD MCRsr5 8000 5
330 *SRLOAD MCRsr6 8000 6
340 *SRLOAD MCRsr7 8000 7
350 *LOAD MCRrider
360 ?&499=&60:CALL &400
370 ?&1A94=QX:CALL &664B
375 ENDPROC
380 DEFPROCNumbers
390 REPEAT:INPUT"QUALIFYING POSITION (NORMAL 6)? "QX:UNTIL QX>0 AND QX<61
400 IF G$="!" THEN REPEAT:INPUT"SPEED LOSS AFTER GOING INTO BACK OF OTHER RIDERS (NORMAL 110)? "CX:UNTIL CX>0 AND CX<151
410 IF G$="1" THEN REPEAT:INPUT"SPEED LOSS AFTER SHUNT (NORMAL 7)? "SX:UNTIL SX>0 AND SX<151
420 PRINT"INSERT GAMES DISC"
430 G=GET
440 *INIT
450 VDU22,5
460 *LOAD 0.NEWPANL
470 VDU 23,8202,0,0,0,0
480 ENDPROC

```

Hints 'n' Tips

Time to clear the desk a bit of some of the pile of goodies that at times threaten to hide the joystick and the glass of wine - yes, it's bumper variety poke time again at your friendly Arcade!

Which means, of course, that this is just the moment to send in your tip, hint, playing strategy or map - no waiting, another Arcade along in a moment. So, here goes!

Boffin

Quick infinite life poke from Jonathan Temple of Nottingham: *LOAD (last part), !&1778=&7D001A9, CALL &5B80.

Contraption

Another quick life poke from Jonathan Temple: LOAD"" the first program and then add the following lines - 3 !&2F40=&20202E4C:&2FAF=&0809004C 4 REPEAT:CLS 5 INPUT""Number of lives (1-18): ";N% 6 UNTIL N%>0 AND N%<19 7 !&900=&A9FFF720:&904=N% 8 !&905=&4C19378D:&909=&1100

Then just RUN the program and enter the number of lives when prompted.

Bonus Time

A collection of quick pokes from Chris Knight from Tasmania:

Crazy Tracer: *LOAD (main prog), ?&1B35=&(number of lives), ?&1D21=&(number of jumps), PAGE=&4500, RUN.

One Last Game: *LOAD (main prog), 2130 L% = 0:S% = 0:B% = (number of lives), CALL &63D0.

Fortress: *LOAD (main prog), ?&1B2D = &(amount of fuel), ?&2A98 = &(point increase), CALL &6900.

Tempest: *LOAD (main prog), ?&2E2B = &(number of lives), CALL &4300.

Painter: *LOAD (main prog), ?&24C1 = &(number of lives), CALL &3B00.

Life of Repton

Too early to give you all the codes and passwords (patience - I've got them all already) but D.Northcott of St.Austell has discovered a couple of odd things. Firstly, on his tape version the edit code for screen 1A (BABY) comes up as 15890 rather than the correct 56882.

Secondly, in the instructions, the third set of screens are called TEENAGE, but they are saved to tape as TEENS.

Mysteries, indeed!

Slowit

Having trouble with games that are too fast for you? I know, the problems of advancing years and decreasing speed of reactions. Still, R.Leach of Coseley, West Midlands has an answer with his *Slowit* program. Just type in Listing 2, SAVE it, RUN it and then LOAD your game as normal. <f0> will then slow the game down, <f1> will speed it up - you can change the speed as you like.

The program uses the same memory locations as Mark Gidley's Easy Poke program, so anything that works there works here.

```
>
10REM ** SLOWIT **
20REM ** by **
30REM ** R. LEACH **
40REM To change speed chang
e minus values in lines 160 an
d 220 using page 275 of the Us
er Guide for inkey values.
50P=0 TO 2 STEP 2
60P%=&03A1
70LOPTP
80.code
```

```
90LDX &03A0
100.1oop LDY &03A0
110.1op2 DEY
120BNE 1op2
130DEX
140BNE 1oop
150LDA &B1
160LDX &256-33
170LDY &FF:JSR &FFF4:TYA:BE
Q fast
180LDA &03A0:CMF #0
190BEQ fast:DEC &03A0
200.fast
210LDA &B1
220LDX &256-114
230LDY &FF:JSR &FFF4:TYA:BE
Q exit
240LDA &03A0:CMF #255
250BEQ exit:INC &03A0
260.exit RTS
270JNEXT P
280?&03A0=1
290?&220=&A1
300?&221=&03
310*FX 14,4
320CLS
330PRINT "SLOWIT now install
ed"
340PRINT " use F0
"
350PRINT " and F1
"
360PRINT " to change speed
"
```

Archie Zarchie

No excuses for yet another bit of blurb about the Archimedes game *Zarch*. Ian McAlpine from Birmingham has found a real live sea monster in the game - along the coastline in wave 3 there is a kind of spike-backed shark worth 1000 points.

Personally I think his letter is just a bit of ego massage - just think: he has an Archimedes, he has *Zarch* and he's got as far as wave 3. Don'tcha just hate him!

Seriously, though, he also points out that Superior are wrong in saying that you get an extra life and smart bomb every 5,000 points - in fact it's an extra life and smart bomb after every 10,000 points once you've reached 20,000 points.

See what I mean? He's also got more than 20,000 points!

Repo Ball Diary

The diary of the gestation of *Omega Orb* written by Peter Scott for ASL was one of the most popular features run so far in The Arcade. But how could we top it? Simple - just find another game in development.

Easier said than done. Despite the illusion that I know all some months ahead of the game and that nothing is coded for the BBC without endless development versions winging their way to Golden Square, the truth is rather different - some programmers are amazingly helpful and some software houses can be conned into saying more about their future releases than they mean to. How nice then to talk to John Mackay, coder of the rather shallow *Green Beret* and the more

intriguing *Krakout!* (last month's Game of the Month), who was just about to start work on a new 'instant classic' *Repo Ball*. A quick phone call later and the game's genesis is laid bare before you. Yet another service from The helpful Arcade. And now I'll turn you over to John - can he finish the game in time?

"With *Krakout!* finished, I am now able to do a couple of the projects that I always had in the back of my mind. *Repo Ball* was conceived during the writing of *Green Beret* and has now sufficiently developed to the point that is now ready to be programmed.

"The idea of the game came from transparent bouncing balls!. Originally set on the Moon it has now been shifted to Jupiter's moons. This caters for 14 smaller levels rather than one huge one and also for largely varying landscapes. The main character is the *Repo Ball* - a multi-purpose combat droid with all of the obligatory state-of-the-art weaponry. The plundering Saturnians have attacked Jupiter's moons and are thieving all of their nuclear energy, thus rendering the moons inactive and unable to protect the planet. You as the *Repo Ball* must battle with the attackers, repossess the stolen energy and bring it back into the reactors. So goes the blurb anyway...

"The energy that you repossess can alternatively be used to activate the *Repo-Ball's* defense systems. These include extra firepower, 'lightning', shields etc... There will also be a huge battle at the end of the game with you having to destroy the Saturnian's (Sat's from herein) mother ship which will be approximately six screens long. The game will last and blast at 50 Hertz and runs in a reduced Mode 2.

"Friday, 30th October. Started sketching up a few levels yesterday and have just been working on them today. Each of the moons has an underground cavern. This is the site for their own reactor which is being sucked dry! Have also worked out the method of repossessing. When you shoot a Sat, any radioactive material he is carrying will be absorbed by the *Repo Ball*. You must deposit all isotopes you are carrying into the reactor before you leave a moon by the way. When you have stabilised the reactor, you will then have to deal with the moon's Sat guardian. Each moon has its own guardian with the mother ship being on the last moon. The guardians are not easily beaten! It will take a while before you can work out how to destroy each one. After destroying all the guardians, the game will end as you will have destroyed the Saturnian invasion and re-stabilised all of the moons.

"Saturday, 31st October. Working on game design. The levels are slowly taking shape. Halloween passes by without a showing of the John Carpenter classic. At last the T.V. planners have realised that the backside has been well and truly ripped out of that idea.

"Sunday, 1st November. A few thoughts on the game spoil a perfectly lazy day.

"Monday, 2nd November. Hallelujah!

TROGG#3... for A&B



NEXT: WAIT & SEE!

The ideas rolled in thick and fast today. This design business is turning out to be a piece of cake. Also knocked up the first batch of graphics, which look pretty good. The drawing board is proving to be quite a useful tool in design work.

"Tuesday, 3rd November. After two and a half hours of staring at a blank piece of drawing paper, I finally came to the conclusion that the drawing board is broken, so there are now definite bad vibes between us. Tomorrow I'll fire up the Beeb and draw the first batch of background graphics.

"Wednesday, 4th November. The background graphics came along surprisingly well. There are now lots of foreground graphics to do but I'll leave them for now and try out the first code.

"Thursday, 5th November. The sprite routine now EOR's a 12 pixel by 18 pixel sprite onto the screen in about 17 pixels of raster time. I am not going to get better results than this as the routine has to cope with scrolling. The routine is also totally flexible with sizes, unlike the one I used in *Krakout!* which plotted either an 8x8 sprite or a 12x16 sprite. Working within confinements like that is bad news. Guy Fawkes night round here is as exciting as watching two planks warp. I'd have to go down to Glasgow Green if I wanted to see any decent fireworks but it's too cold and boring when you ain't lighting 'em yourself.

"Friday, 6th November. The drawing board's working again! I drew out some aliens and finished off all of the guardians' designs. One of 'em is a Repo Ball gone bad! This character is gonna chase you around like crazy and try to blow you away. He'll not let up until he is history. Because he chases after you, you can't take to your heels if the going gets tough. I read an article about a new Jeff Minter game today, titled *Die, Filth!*. Face it — the man is cool.

"Saturday, 7th November. A few more ideas on the gameplay for *Repo Ball* have developed and I have one helluva useful

compression system.

"Sunday, 8th November. I think that most of the groundwork is over. The rest of the design will come about during the programming. The levels have still to be finished but the gameplay and features are more or less done. I'm dying to get something visual going on, so tomorrow I'll start on the main graphics.

"Monday, 9th November. Finally found out what was wrong with the Microvitec monitor today while I was picking up some drawing paper. Hopefully it will be goodbye to this Am****d heap of junk that I'm forced to use, when I pick up the parts.

"Tuesday, 10th November. Somebody up there likes me! The Microvitec's working again. I think the old eyes were about to melt under the strain of the other display. Definitely the Wimpy Kingsize of the monitor world. Came up with some cool graphics and modified the *Green Beret* screen definer so I can bolt together the structures that sit on the moons. Got *Arkanoid* out of the library as well. Really nice conversion but still the same old horrid Mode 2 characters and infinitely boring high score table.

"Wednesday, 11th November. More work on graphics produces a landing pad and some nice pipework etc... Have calculated that I'm going to have a possible maximum of 128 8x8 background & foreground chars.

"Thursday, 12th November. Some design and work on graphics. There's gonna be a second Repo Ball that you can rebuild out of old pieces and can be transported into action with you at a critical moment. A once-only item and you can't take it with you when you leave a moon!

"Friday, 13th November. Black Friday this ain't! *Krakout!* payment arrives and a day off is in order.

"Saturday, 14th November. Work didn't start till midnight so I only drew up a few things till I felt tired. I have quite a nice mushroom now along with a surface missile

launcher.

"Sunday, 15th November. Threw together some new pipe graphics which look a damn sight better than the old ones. I am also going to put lasers on the Repo Ball. I fired some up and they look slick, so in they go. I have enough graphics now to start the scrolling. I've now got a list of all the moons with the largest ones first: Ganymede, Callisto, Io, Europa, Amalthea, Himalia, Elara, Thebe, Pasiphae, Sinope, Carme, Anankle, Lysithea and Leda.

"All the moons from Amalthea onwards have a circumferences of 265 to 20 miles. Compared to 3000+ for the first four this is tiny so the smaller moons will be enlarged in the game otherwise they would only be about a screen or two long. This game is definitely not to scale!

"Monday, 16th November. Fired up a new scrolling routine but so far it is only under auto pilot! The scrolling is smooth and looks about the right speed for the game. On the graphics side I managed to draw a disgusting looking guardian which looks like something out of *Alien*. It stands 24 pixels wide by 48 tall and is one ugly mother! I don't think I'll take any pictures of the guardians as this would spoil the game if you knew what you were coming up against. Also knocked together some sprites. *Krakout!* celebration tonight.

"Tuesday, 17th November. Woke to find my mouth was stuck dry. The ubiquitous bottle of Irn-Bru remedied the situation and after an hour of relaxing, it was back to the grinding wheel. First order of the day was to put the scrolling under stick control and after weeding out a few bugs it was working except that the screen seemed to glitch slightly every time the joystick was moved. Might have something to do with the order that I'm doing things. Spend rest of time fiddling about with the sound and graphics.

"Wednesday, 18th November. Fixed the scrolling glitch and adjusted a few things but not much else done.

"Thursday, 19th November. Took a day off of the coding side and finalised the internals. Also noted down a few timings. I reckon there will be about four Sats and the Repo Ball flying about at the same time 'cause I've also to redraw the side column of the screen when it scrolls and redraw all the bullets. If I try for any more then the sprites will come down with a dose of the dreaded flickeritis. A nasty disease, afflicting all sprites who stray too close to the evil raster.

"Friday, 20th November – Monday 24th November. The calm before the storm. Absolutely no work done. All of the grunt-work is done so the main game code is from herein."

Well, if John completes his work, the second part of this coding should be totally under way by the time our next issue hits the stand.

Moan Time, Again

This month's Arcade activist with an axe to grind is 15 year old Chris Knight from Tasmania. Take it away, Chris –

"I read in *The Arcade* that programmers and software houses go off the BBC because of its lack of memory and application as a games machine. Despite the appearance of games such as *Arkanoid*, programmers can still point to their ST/Amiga gems.

"I'm not saying that Beeb software is poorer but just that quality maybe cannot be fitted into 32K. I reckon half of the games currently released for the Commodore and Amstrad could be easily coded for the Beeb and then the software houses would make a fortune!

"But this doesn't apply just to software houses. A few top programmers have now moved on because they think they'll earn more money for their efforts. But why not have their cake and eat it by spending a little spare time converting their games to the BBC?"

Some reasonable points there but Chris does miss the single most important fact about coding for the Amiga/ST market – it's worldwide! Of course, there is a large Beeb market in the UK, but where else? Okay, a few machines in Holland, Australia, the Middle East, etc but think for a moment about the American market. Sure, Beebs exist over there but how many do you think there are? Right.

Xmas – Doncha Hate It?

No, I'm not talking about the surfeit of consumer madness, the unnatural demands on my wine cellar or the unhealthy interest we all show in indigestion remedies over the holiday season! The thing that gets me *really* mad is that the post is disrupted from the start of November.

And that is why you're going to have to wait a whole month to read reviews of *Evening Star*, *Star Wars*, *Grand Prix Triple Decker* (also known as TD 'cos it's too long

to type!), *Invasion Force TD*, *Grebbit TD*, *Lunar Invasion TD*, *Howzat! TD*, *Rik the Roadie*, *Guildmaster*, *Mission Icarus*, *Cute to Kill* and a few others I've forgotten.

Somewhere, at this moment, such gems languish in the bowels of the Post Office. Happy New Year!

*LOADing soon

● A Quick update on cancellations first of all – latest word on CRL's mythical *Cyborg* is that it has slipped into some kind of limbo. Don't bother waiting for this one, nor for Martech's *The Armageddon Man* either. Similarly unlikely now, given the major changes there, are ASL's *3D Golf* and *Daxis*.

● Oops time! Back in the December Arcade I mentioned a motor racing management game under development for ASL. I've since had a note from the programmers, Philip Watts and Tim Bateman, to asking me to point out that – a) neither the Elk or the Beeb have enough memory for the large amounts of data required, b) the Archie does not have a large enough data base, c) no contract has been signed with ASL, and d) the game may not even be produced. Glad to oblige, lads.

● Usual delays section: Tynesoft's *Indoor Sports* back to December and *Saigon* delayed till '88; ASL's *Powerpack 3* now 'unlikely' before Christmas; Top Ten's *Peter Scott Trilogy* pushed back to January; Code Masters' *BMX Simulator* now likely for March – the first Beeb product from the Darling brothers on their way to the first million pounds; Alternative's *Mineshaft* back a month to December, together with *Confuzion* and *Dead or Alive*; CRL's releases also pushed back, mainly to May to catch the next Acorn User Show – including *Colossus Mah Jong*, *Colossus Roulette* and the proposed disc compilations, however *Colossus Bridge* should be with us in February; Argonaut's Archie space adventure game is still on target for '88.

● New games! I've only heard of a few additions – CRL's *Discovery* due in March; ASL's *Guild Master* ('a bit like *Ravenskull* plus a great soundtrack') in January; Top Ten's *Kourtyard* (by Mark Rogers who doesn't appear to be able to spell) due also in January.

● Out already, as far as I can see, is a £4.99 budget pack from Prism (containing the adventures *Paras*, *Battlezone 2000*, *Johnny Reb* and *The Stolen Lamp*); a graphic adventure *The Lost Crystal* from Epic Software; and a double disc adventure from Vanadis Software, *Inferno*.

Company Changes

A bit of musical chairs in the software field this month. It is a bit early to say what effect these changes will have on releases for the Beeb; we'll have to wait and see.

Firstly and nearest to home, our sister/cousin (?) company Argus Press Software will become Grand Slam Entertainments Ltd in January, following a share buy-out by current

MD Stephen Hall. Apparently the existing trading names (Bug-Byte, Quicksilva, Lothlorien, Mind Games and Grand Slam) will continue.

The incestuous sounding relationships between ASL and Top Ten now seem clear: Top Ten Software is part of Maynard International, run by Martin Maynard who used to be a partner in ASL with the help of Arcade friend Darryl Still (ex-ASL software development manager) whilst ASL/Audiogenic has moved much closer to parent company Supasoft, the Commodore specialists, with MD Peter Calver taking control. Hope it is now clear; there's a test later.

"But we don't care about the names, just the games!" cry a thousand Arcade addicts. Okay. Top Ten's projected releases are listed in this month's *LOADing Soon, with the only possible addition being *Kwangtung* which those with memories will recall was submitted by an Arcade reader from Australia.

More plans from the reorganised ASL – in a change of style from the old ASL's very early announcements of games, the new company will only announce games that are 'not only good but original' when they're close to release. Hence the shelving of *Daxis* and *3D Golf*, the hard reappraisal of *Powerpack 3* and the tight-lipped style of new head honcho Peter Calver. The most I could prise out of him was that *Guildmaster* is due in January, *Impact* will get a pre Christmas Beeb release and that there was 'another release' on its way. One interesting development could well be a couple of twin-packs, with a possible *Scott Free* compilation containing *Omega Orb* and *Last of the Free*. But this is not yet finalised.

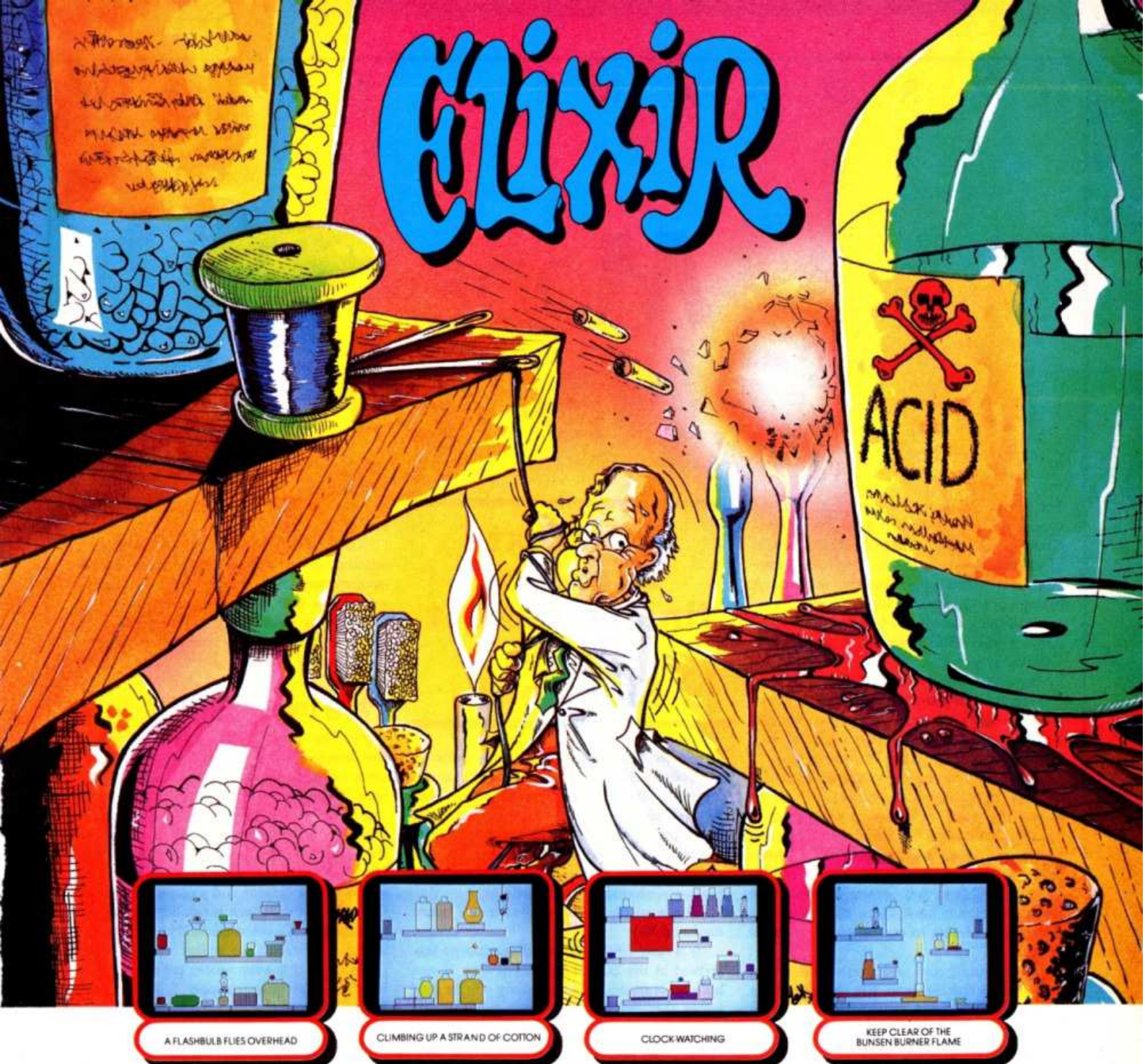
Just one more move to make my job harder!

And Finally...

And finally we come, as if by some alchemical magic, to the end of another fun-packed Arcade. Time distortion is part of the way of life here, by the way. You're probably reading this February issue in January, body heavy with good food and mind depressed because Father Christmas didn't bring you an Archimedes (don't worry – I didn't get one either!). I'm actually writing this late, as ever! (don't we know it! – Ed.) at the end of November, which means that I can't give you my list of 1987 classics until the March issue, which I'll be writing mid-December. Confused? You would be, if you had my job. But why not drop me a line with your nominations for the best arcade game, the best arcade adventure and the best other games of the year? Unless something stupendous arrives during the next three weeks, I'm almost certain to plump for *Firetrack* as outright winner. Do you agree?

Of course you can still contact me as usual via **Micronet mbx 919999020** or by post to: **Dave Reeder, The Arcade, A&B Computing, ASP Ltd, 1 Golden Square, London W1R 3AB.**

Elixir



A FLASHBULB FLIES OVERHEAD

CLIMBING UP A STRAND OF COTTON

CLOCK-WATCHING

KEEP CLEAR OF THE BUNSEN BURNER FLAME

Help Poor Old Cyril to Find the Magic Elixir

Imagine the scene:

You are Cyril, a likeable old gentleman — the proprietor of a small but busy chemist's shop. One evening, after a hard day's work, you accidentally take a swig of a potent liquid: a strong reducing agent.

Within minutes you have shrunk down to the size of a bottle of aspirins. Frightened and alone, at first you panic... then you remember the magic elixir which is stored at the back of the shop on the top shelf.

The elixir just might restore you to your normal size... it's your only hope. But can you possibly reach it; you'll have to work out a suitable route by climbing up and down and across the shelves.

A fascinating, humorous game packed with strategical puzzles and problems. Keep clear of the lipstick missiles, leap over the exploding flash-bulbs, dodge the dripping acid, and watch out for the curious "circulasaurus" creature!

BBC Micro Cassette	£9.95	Acorn Electron Cassette	£9.95
BBC Micro 5¼" Disc	£11.95	Acorn Electron 5¼" Disc	£11.95
BBC Master Compact 3½" Disc	£14.95	Acorn Electron 3½" Disc	£14.95

(Compatible with the BBC B, B+ and Master Series computers).

The screen pictures show the BBC Micro version of the game.
The graphics of other versions may vary.

PRIZE COMPETITION

If you complete Elixir (by restoring Cyril The Chemist to his normal size), you can enter our competition. Prizes include an impressive trophy, 10 chemistry sets, and signed certificates for runners-up.

Closing Date: 30th June, 1988.

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MODE 7 HEAVEN

The Acorn Electron is the archetypal add-on computer; on its own it is a very simple non-nonsense 32K computer, but with the advent of shadow RAM, sideways RAM, disc interfaces and turbo upgrades, the machine is having a pretty good run for its money.

One thing has always been in the way of offering true BBC compatibility however... Teletext graphics.

Say the words "Teletext" to a hardened Electron user and their eyes will glisten over with thoughts of Prestel, Ceefax, Bulletin boards, *more memory* and a majority of BBC micro programs, including Wordwise Plus.

In the past the way around the Electron's inability to display Teletext was to either forget the piece of software and go for a rewrite (Wordwise Plus for the Electron and high score tables in games etc) or to "simulate" the graphic characters in software by creating a black and white facimile – a method that has been quite successful, but nevertheless failing to put over the colourful effect!

At the first Acorn User show way back in 1984, when the Electron was shown for the first time to packed crowds, a small stand

Teletext Graphics finally make it on the Electron!

named Sir Computers (sadly, now defunct) was rumoured to have a Mode 7 card for the Electron. Ugly rumours were afoot that Acorn "asked" for the board to be taken down for fear of distracting the crowds at the launch. This was never substantiated, but I have a feeling that there is some truth to the story, no matter how small.

The launch went ahead, the Mode 7 board died a death.

It is now 1988 and a small cardboard box arrived in the post without warning, it was heavily wrapped and was oblong – little did I know that inside this unassuming box was

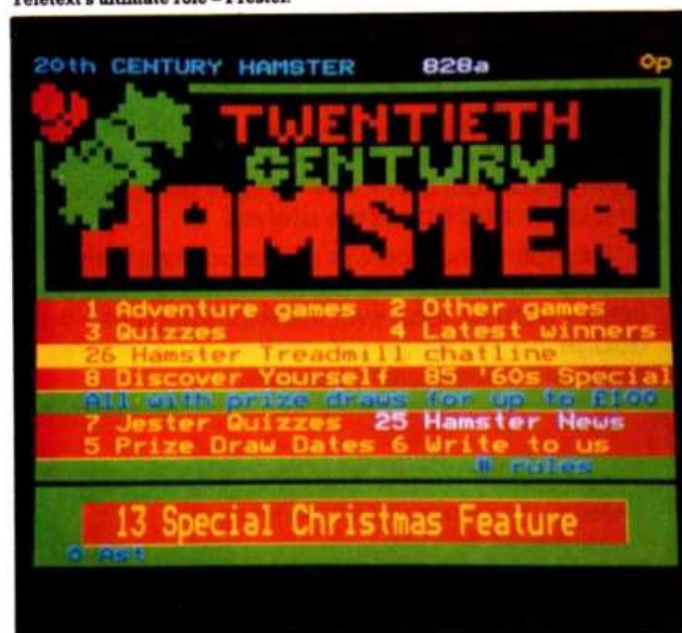
another box marked the *Jafa Systems Mode 7 board*.

This board, whilst having absolutely nothing to do with the original Sir board, nevertheless sets out to create exactly what we all saw four years ago; it's been a long time coming folks, but at last the answer to every Electron users' prayer is here, a realio trulio Mode 7 board!

Plug in and go!

Right! The board is about the same size as the Slogger Rombox Plus and is about the same width so it sits neatly and tidily on the back (and it bolts into place as well!). On the top of the box is an enigmatic square green button which replaces the <Break> key on the Electron (as this will <Break> into Mode 7. Out of the side is a new RGB socket, a new TV modulator and a connecting cable. Other than that, there is nothing else to the board, there is a sideways ROM built into the board so there is no messy cartridge slot required, and it even works off of the Electron's existing power supply... a nice touch that one.

Teletext's ultimate role – Prestel.



Micronet – now Electron compatible.



Plugging in the board (correctly connecting the monitor and the Elk) and powering up gives... absolutely nothing! Remember I said there was a Sideways ROM inside the board? Well, the ROM has to be invoked by typing *MODE7 ON or OFF (I sigh with relief!) – a companion TEST command displays a seven-colour Teletext bar down the screen, similar to broadcasting test signals... Things are looking good.

First of all I pull out some undemanding Mode 7 software, an educational package – hey, it works! All of the proper Teletext characters are here there are the flashing ones, the dotted effects. The trial program I loaded (from disc) works fine, albeit slowly, and there is at last, enough memory to start thinking about writing BBC BASIC programs on the Elk without having to use Shadow memory or a second processor.

Lets be a bit sneaky now... I unplugged my copy of Wordwise Plus from the Beeb and shoved it into a spare socket on the Rombox Plus. I entered *Wordwise and there it is, that lovely cyan and yellow menu! I loaded up a few segment files and they all work properly, again a bit slowly. There is an additional command in the Mode 7 ROM that enables the Electron's function keys and turns them into proper BBC Micro type function keys... this is fun!

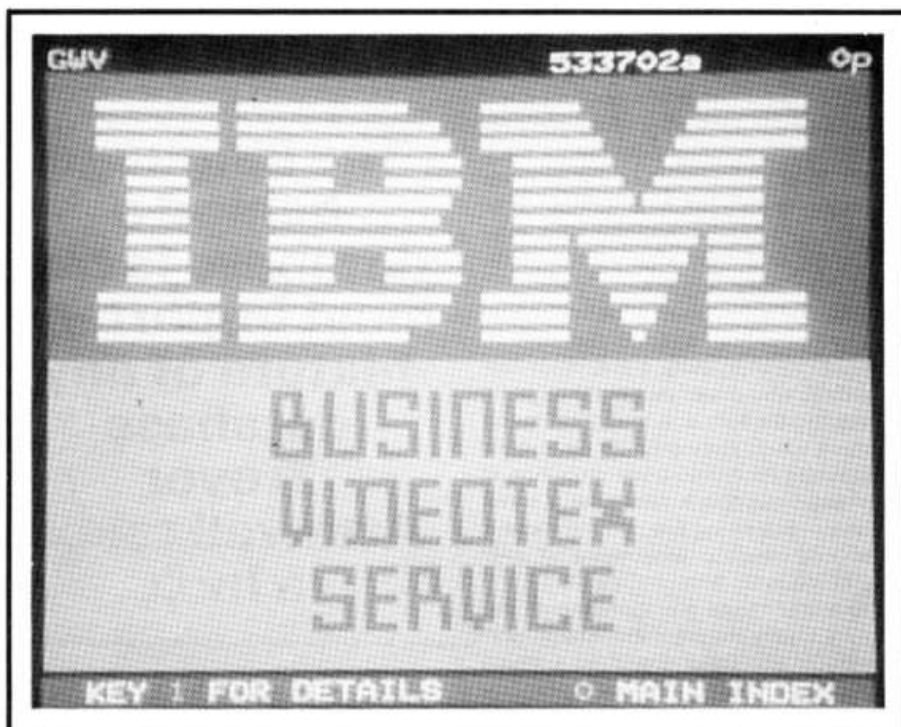
Time to speed things up now... I plugged in the 6502 Second Processor and again, 6502 second processor programs work with the Mode 7 board, as does the Slogger Master Board and Shadow RAM – is there no end to the compatibility of this board?

I plugged in the AndyK RS232 interface and plugged in a specially modified version of the Micronet ROM, plugging in my old Beeb Modem (an Apollo model) I dialled up and got up on Prestel, mailboxes everywhere (**Hey guys, you won't believe this, but I am sending this to you using an Electron with a Mode 7 card!**) A few hours (and no doubt a killer of a phone bill) later, I logged off of my last bulletin board and happily went to bed.

Next day, I woke up bright and early ready to read the CEEFAX pages using an Electron Morley Teletext Adapter and a Modified Morley ROM – I scan the international news pages, I have a quick look at the share prices between gulping down my first coffee of the day and it's time to do some *Telesoftware Downloading!*

This is where the Electron really begins to look impressive; plugged into a Solidisk Disc interface I pulled all of the software for the Beeb straight down, fresh from the BBC transmitters and I started running the software...

Not all of the software on Teletext runs on the BBC micro, but over the past four weeks I can say that 90% of the free software works on the Elk, all of it written in



The Elk is now an inexpensive terminal

BASIC and none of it is Beeb specific (ie Master only)... Hell, even a few of the utility ROM images worked as well!

The Morley Teletext adapter isn't supposed to work with the Jafa Mode 7 board, but the engineer who created this board clearly understands that in order to make people want to buy his board, then he will have to supply software that makes use of Mode 7 – this is why he is currently negotiating with Morley Electronics (who make some very impressive tackle indeed) and Micronet for the rights to sell modified software using the board.

Wordwise Plus is a straight plug in and go job; there are no messy software "kludges" to be loaded, you can go out and buy a copy of the ROM and plug it in and start working – it's as simple as that!

Games are a bit different – The silly thing about the Electron is that because it has so little memory inside it, games are nigh on impossible to even load into it. Many programs have to be loaded in and assembled in order to run, and if you don't have enough memory, there is little chance of getting software to load at all!

This is no longer the case with the Elk and the Mode 7 board; all of the Acornsoft titles loaded and Assembled (not all executed), but the memory was there – of the games that did load (Snapper, Monsters etc) the title screens were all in glorious Teletext and the high score tables were all there in their full glory – even putting on a turbo board made the games playable!

The next test was to load in ISO Pascal,

write a quick program to do something silly and watch it work in Mode 6 – fine, the compiler runs happily, now we'll change things so that the program runs in Mode 7 and run it again. The program runs faster! This is because the screen is written to quicker using the Mullard Mode 7 chip than with the ULA on the Electron's board.

This is a common feature and something to keep in mind when writing software for the Beeb, Mode 7 has a far higher priority as a screen driver because it has its own processor (the Mullard chip) and works off its own bat (ie not the ULA).

Conclusions

I have tried the Mode 7 board on nearly every piece of Electron hardware and software I could get my hands on and most of it worked – if it required the use of Mode 7!

Interestingly enough, some Electron software actually gave me a Mode 7 screen on the high score tables, which is weird to say the least! I can only assume that either an old BBC Micro code was left in after the conversion, or it was written to take into account a possible Mode 7 upgrade.

This is a quality product, well made, and is compatible with a majority of Elk products, including the Plus 3 and the Plus 1 – buy it.

Factfile

● The Mode 7 Board costs £89 inclusive and is available from Jafa Systems, 9 Lon-y-Garwa, Caerphilly, Mid Glamorgan. CF8 1NL.
☎ (0222) 887203.

INTERBASICS

The long-awaited arrival of *Inter-Base* came as a considerable surprise to many prospective purchasers, as many expectations were dashed. Those who anticipated one or more immediately useable and immensely powerful databases only found a very good but relatively simple card index affair with few frills, plus a programming language.

While the latter offers great rewards in the shape of custom-designed databases to any degree of complexity, this is pie-in-the-sky to those who cannot master the language. Regrettably, the manual is a very unfriendly document which gives only the most basic programming information, and no tuition at all. In some respects it resembles a travel brochure – everything you need to know is probably in there.... somewhere, if only hiding between the lines.

Explanatory texts are appearing, as expected (CC have recently decided to produce their own), but these should be a bonus rather than a necessity. Third party programming support is almost certain, but at the moment, there is nothing useful available, however *Inter-Base* has drummed up some support of its own, for example, one software consultant offers to provide customised programs – for a fee – and I will deal with this in a moment.

The card index database has already been reviewed very thoroughly by Gordon Taylor in the September 1987 issue, and we shall thus be concerned here only with the programming language, which will be referred to as *IBASIC* for short. This major part of the chip has yet to be fully reviewed elsewhere.

Whilst *IBASIC* is aimed particularly at database creation, it can be used (with considerable effect) as a stand-alone language for general purpose programming. It is essentially BASIC, but it is better structured, with a great many powerful additions and extensions – in fact, as a language, it is full of pleasant surprises.

There are no line numbers as labels are used where necessary. Each program is contained within a string which is limited in length only by the memory available. The string name is the program name, which defaults to P\$, but can be changed as required. If a new default string is defined, the original string remains intact, so that more than one program can be held in memory simultaneously.

IBASIC embodies a screen editor of *Inter-Word* type, using the same control conventions, in which it is particularly easy to write and modify programs. The editor can work in any screen mode, and can also be entered by various commands, specifying the cursor position on entry if required, and with or without the ability to change the string (ie

The language behind a database is the most important feature of any database

Trevor Attewell takes a look

program) being edited. For example, these facilities allow one program to carry out a search and edit operation on another.

The programming language is entered through an option in the main menu, ie the database menu displayed when *Inter-Base* is first called. Confirmation is required, since entering the editor will close any open database, with the possible loss of records being worked on. The program menu then appears. Options are provided for loading, saving, search, edit or replace operations, printing, changing edit screen mode and program deletion. All options involving the program work on the default string. Any disc filename can be associated with any string.

Pressing a key other than an option number enters command mode, indicated by a right-arrow prompt. In this mode *IBASIC* commands can be entered for immediate execution. Pressing <Esc> twice returns to the program menu, and <Esc> then toggles between menu and actual program. The main menu can be re-entered from the program menu, again after confirmation, because any program in the editor will be lost. A program is executed from the program menu simply by inputting the name of the string in which it exists, or by using *RUN PROG\$*.

Every program will be entered at a *START* label and normally finishes with *END*, but these do not have to be the first and last lines. This allows procedures and so on to be placed above *START*, as well as below *END*.

Where to put your programs

In addition to having multiple programs in memory, some or all of them can be installed in sideways RAM or even in ROM. Before

doing so they must be tokenised, for which purpose a command is provided.

Tokenisation reduces the length of the overall program(s), but naturally renders the program uneditable. More than one program can be installed, and up to four RAM chips can be used. This is most useful with programs which use a lot of data (would you believe a database?), since all the normal memory can be used for the data. The names of installed programs are listed by a help command. A specific type of installed program can also be written using five special labels, *ENTRY*, *ERROR*, *FATAL*, *RESTART* and *START*. The last is the entry point when the program is run normally.

If *ENTERed*, the program becomes the default, and is independent of the menu. At program termination, control is returned to the last program entered. Errors (unless trapped by *ON ERROR*), fatal errors and *END* cause re-entry at the *ERROR*, *FATAL* and *RESTART* labels respectively, so a fresh start can be made even after a fatal error. The only way back to the menu is by *ENTER MENU*, which returns control to the main menu, not the program one. *BREAK* normally crashes everything. RAM files can also be in user RAM, in which case an *ALLOC* command will reserve a specified number of bytes for program use. However, this alternative is generally unattractive because memory is too limited.

The manual divides *IBASIC* keywords into groups according to usage; Although most *IBASIC* commands take compulsory or optional parameters, these will be omitted to save space. Essentially all BASIC commands are implemented, the only missing keywords being those which are irrelevant, such as *AUTO*, *CHAIN*, *LIST*, *NEW*, *OLD* & *RENUMBER*. *PAGE*, *TOP*, *LOMEM* and *HIMEM* which have no significance in the *IBASIC* environment, so these pseudo-variables are omitted. A *FREE* command discloses the amount of free memory. One or two commands are used with slight differences, for example *CLEAR*, *CLOSE*, *COUNT* & *TRACE*.

Files and databases

The largest group of additions contains the file handling and database commands. The normal BASIC file-handling commands are available, (*BGET*, *BPUT*, *EOF* etc), but *BPUT* can output a byte or a string. *BGET\$* is added to read strings, and *LGET\$* will read a string as far as a specifiable terminator. *PRINT TO* is similar to the normal *PRINT\$*, but sends the specified value to file in a special tokenised format. This may contain long strings or dates which are not readable by BASIC. However, BASIC files can be read

with INPUT FROM.

Some 66 (!) database commands cover the entire process of setting up the core of a database, defining its size and that of the records, fixing the field structure, index creation, key handling and searching, adding and deleting records, sorting keys and records, and so on... Commands are also available to read back the status of the important database parameters.

Looking at a few examples just to get some idea of the coverage, **CREATE DB** sets up a database of specified name, length, and information block size on disc. The information block must be able to hold all the details necessary to set up and use the database. Before the database can be used, it is opened with **USE DB**. Fields are added with **ADD FIELD**, specifying the field type, and **BUFLN** is used to set the extent to which any record can be enlarged during subsequent editing, including none.

CREATE INDEX...ON will create a named index file on a specified field of the currently opened database, and **CREATE USER INDEX...ON** does the same thing for a closed database. **USE INDEX** opens an index for use. **ENABLE INDEX** and **DISABLE INDEX** both add, and remove, a filename from the index list. **MARK REC** "marks" a record (when it is deleted), and **USE UNMARKED** will then prime the **SKIP** command to ignore all marked records, for example during a search. **USE MARKED** will skip all except the marked records.

It is not too difficult for the average programmer to write a simple database using these, and other facilities; Possibly the only reason for doing so would be as a familiarisation exercise, since the built-in database will fill the most common needs. To write a complex database for a specific purpose would involve a lot of commitment and a great deal of trial and error, due largely to the inadequacies of the manual, which are the most apparent in this area.

Fancy a date?

BASIC has no commands to deal specifically with dates, but IBASIC does. The "@" symbol is used to identify dates, which may be in any of a number of formats assigned to a date string. These include anything likely to be found in practice, for example:

Anniversary@=@ "2,4,87"

Anniversary@=@ "2nd April 1987"

Anniversary@=@ "2/4/87"

Anniversary@=@ "2/AP/1987"

The programmer's YYMMDD is not needed since, IBASIC dates can be added or subtracted, compared (using the normal inequalities), and the day, month or year can be set or read. A nice touch is that leap years are accounted for. When printing dates, three bits in the most significant byte of %@ (the format controller) determine which of six formats will be used. The same format control is applied when STR\$ is used to convert a date to a string. These facilities are useful in many general programs.

DATABASE : None

(C) Computer Concepts 1987

- 1) Open database
- 2) Enable Index (None)
- 3) Set condition
- 4) Edit fields
- 5) Option menu
- 6) Print records
- 7) Build index
- 8) Create new database
- 9) Program menu

ESC Edit current record

Enter choice _

IBASIC uses the same operators as BASIC, with the addition of IN, which allows searching for one string within another. % precedes an integer, so that %R is the same as the BASIC R%. In addition, binary numbers can be used if preceded by %. %@ is the general formatting operator, but the **FORMAT** command can be used.

The sound commands are exactly the same as BASIC, and the latter's graphics are also supported, with the addition of a **WINDOW** command simplifying the creation of text windows. The use of **MODE** is unrestricted - Unlike BBC BASIC, IBASIC must be used to change mode in procedures.

The additional loop structures have been widely publicised. Briefly, the IF...THEN...ELSE structure has been enhanced. It may be used as a single-line structure, as in BASIC, but it can be multi-line with multiple ELSE statements using **ENDIF** as terminator. A **WHILE...ENDWHILE** loop fills a significant gap in BASIC, enabling condition testing before the loop is entered. Also, the **CASE ... WHEN ... OTHERWISE ... ENDCASE** structure, which allows any number of possible actions, may involve multiple statements,

according to the outcome of the controlling expression.

OTHERWISE is optional - if omitted, any possibility not otherwise accounted for will be ignored. The remaining BASIC loop structures **FOR...STEP...NEXT**, **REPEAT...UNTIL** and even **GOSUB...RETURN** are supported. The last-named should now be redundant except possibly for the odd patching job on an old program.

Inputting and printing commands are much the same as in BASIC, except that numbers are evaluated on input, so that hexadecimal or binary numbers can be handled if preceded by the appropriate operator.

When using **INPUT** any prompt can be inserted, either in quotes or as a string variable, and multiple prompts for input variables can be specified on a single line. Sensibly, any question mark is left to the user, so there is no need to suppress an unwanted one, as in BASIC. **X=INPUT** is provided as a more convenient alternative to **X=EVAL (INPUT\$)**. Data is read from a string in IBASIC, so that it can also be prepared by the program itself, or by another program.

INTER-BASE 0

(C) Computer Concepts 1987

- 1) Save program
- 2) Load program
- 3) Search and edit
- 4) Search and replace
- 5) Set default program (P\$)
- 6) Print program
- 7) Set screen mode
- 8) Delete program
- 9) Main menu

ESC Edit program

Please enter choice _

READ and UNREAD are used to enter or quit a data string, and the item separator can be specified. A data string is locked during reading. `X=DATA` (or `X$=DATA$`) is used to read the next item, and RESTORE resets the data pointer as usual. EOD (end of data) returns TRUE when all data has been read, and can be used to avoid "Out of data" errors.

Strings to conjure with

Although the normal BASIC string handling commands are supported, IBASIC provides much more comprehensive facilities. For example, any part of a string can be directly accessed, so that `MID$(T$,X,1)` can be replaced by `T$(X)`. This can be used for assignment, for example `T$(X)="a"`, allowing any part of a string to be edited. Similarly `A$="get": LEFT$(A$,1)="b"` will turn "get" into "bet".

Whilst some string handling commands can only deal with the usual maximum of 255 characters, a number of them can handle strings of any length – another important advantage. Among extra commands, `LOWER$` converts a string to lower case, `UPPER$` to upper case and `INITIAL$` sets the first character to upper case and the rest to lower, particularly useful when changing personal names into a standard format. `CODE$` uses the *Soundex* algorithm to produce a coded form of a string which sounds like the original enabling different words which sound alike to be compared.

`TRIM$` lops off any spaces from the end of a string, `MATCH` compares two strings, and accepts single or multiple wildcards. `COUNT` returns the number of separate items in a string, the separator being definable, while `ITEM$` returns a specified item. Related to the latter are `WORD$` and `LINE$`, in which the separator is always a space or carriage return, respectively. `ITEM$` used on the right hand side of an expression returns the number of an item within a list, numbering from the left. BASIC string concatenation is supported, but it is also possible to join a string on to the front, end or even into the middle of another, regardless of the length of either string or of the result.

It is also possible to assign a variable to part of a string and thence to modify or delete it. In the former case, the replacement string can be longer, shorter or the same length as the original.

Array handling is compatible with BASIC, but is far more flexible, since arrays may be non-rectangular and may contain a mixture of element types. Arrays are dimensioned much as in BASIC, but the element types for each subscript are defined by the first entry in each case. Thus (quoting the manual, in which this example is not alone in containing an error):

```
DIM record(),3 record()=["John Smith",
24,2.25] PRINT record()
will print: John Smith 24 2.25 As in
```

BASIC, an array may not be re-dimensioned, but it can be removed routinely, since the latter command does not give an error if the array does not exist. Elements are numbered from 1, not 0 as in BASIC, which suits us humans better! The little extra work required when handling rectangular arrays (compared with BASIC) is a small price for the overall flexibility.

`TYPE` returns a code specifying the type of a variable – it can also indicate a non-existent variable name. This is useful when finding out what type of variable has been used as an array element.

Procedures and functions are similar to BASIC, but both are entered as labels, and IBASIC allows parameters to be passed by reference or by value, and values can be altered and returned. Arrays can also be passed to procedures. As usual, functions must return a value. These enhancements alone would be worth the cost of Inter-Base to some programmers!

The normal BASIC range of mathematical functions is supported, except that `RND` cannot take an argument, and returns only random numbers between 0 and 1. Other ranges are easily obtained by multiplication or division. Inter-Base works to 9 significant figures, as BASIC does.

Built-in utilities

Inter-Base has no assembler, but `CALL` and `USR` are included, so that pre-located machine code can be called and values returned. Indirection operators are also available, but all these memory intrusions must be used with great care to avoid a crash. Some useful utilities include `LOCK` and `UNLOCK`, which protect or unprotect a specified variable from being altered, and `REMOVE`, which allows an unlocked variable to be disposed of. `RVAR` removes only unlocked variables of specified types (the choice is `INT`, `REAL`, `DATE`, `STRING` or `ARRAY`), `PVAR` will print the values of any selected variable types, and `LVAR` will list the variable names for given type(s). `SWAP` will exchange the values of two specified variables of the same type (a button performing a similar function is a useful feature of most scientific calculators). `ESCAPE OFF` disables the `ESC` key, and `ESCAPE ON` restores it again.

Since there are no line numbers in IBASIC, error handling is similar to that of Pascal. The error line is printed, followed by the error type, the program in which it occurred (remember that more than one may be involved), and the last label encountered before the error was found. Given this information, an error can usually be spotted quite quickly, and editing is ridiculously easy. `TRACE` can be used for debugging, and returns each label as it is passed.

Because Inter-Base is a ROM-LINK product, all the possibilities of interchanging data and commands between Inter-Base and any other member of the series can be used. At the simplest level it is useful to be able to carry out immediate calculations in IBASIC

directly from the Inter-Word menu, or to execute a program held in Inter-Base itself. The alternative of exiting Inter-Word for BASIC and subsequently returning to Inter-Word will often lose your text, but there is no problem in entering and leaving Inter-Base. Among other possibilities is the use of material contained in an Inter-Base database for mail-merging. Conversely, material for insertion into a database can be prepared or edited in Inter-Word. Similar transfers can be made to or from Inter-Chart and Inter-Sheet. In some cases extra work space would need to be reserved (`ALLOC`) before leaving Inter-Base for another package.

An example disc is supplied with Inter-Base. It is mainly concerned with databases, but does contain five programs in IBASIC. These are all database utilities, but they do give some "feel" for the language. The disc contains an example of mail-merging.

Serious consideration was given to including some sample programs in this review. However, it was decided that a program to do anything really useful would take up far too much space, while a few trivial little 10-liners could not possibly demonstrate what the language is really all about. Better to wait for some of the many good application programs that will hopefully arrive soon!

Wrapping Up

It must be understood that Inter-Base is intended to be, first and foremost a programming language: The card-index database is a useful built-in application, but is secondary to the main function. The language is essentially BASIC, and supports all BASIC structures, but it goes far beyond any version of BBC BASIC, both in power and flexibility. It is aimed chiefly at database construction, for which it is superb, but inasmuch as it extends BASIC (and removes its most annoying limitations) it will be a valuable tool for programmers in every area.

It is difficult to assess the "value for money" of this product, since it depends on the extent and nature of each proposed application. For myself, any serious future BASIC programming which is not required to be portable to non-Inter-Base users will be in IBASIC. Anyone who needs a really specialised database, necessitating custom design, is also likely to find this chip quite invaluable once it has been mastered (which may take some time – Ed). Inter-Base may seem unapproachable at first, but I suspect that it will slowly acquire many devotees.

Customised programs

● Enquiries about customised programs should be addressed to the following, and not to A&B. Mr. Austen will provide various Inter-Base packages, and is working on a handbook with examples and applications. A user magazine is also a possibility if there is sufficient interest. Contact: Mark Austen, 10 Cliffe Court Rugby Road Milverton Leamington Spa, CV32 6DW. ☎ (0926) 312850

COMPACT CORNER



A new control panel for the companion.



Side on - the companion fitted.

Three for the price of one seemed on the face of it a sensible way to start expanding the basic unit

It occurred to me it was time for some ambition to come to the fore. Expansion to the basic unit by the fitting of what I believe is known in the trade, and the world of slick and competent computer users, as an *Add-on*.

I was rather taken with the idea of a Mouse and a Joystick as it seemed to me these would quicken my journey into unknown areas such as graphic art and games where access to icons and fire buttons held

promise of improved reaction time. Where to start was the next question. The instruction at the rear of the *Welcome Guide* offered some advice, though somewhat sparse. I would be able to provide *greater precision* to applications, particularly those requiring a *two dimensional application*. I hesitated, what did this mean, what was I letting myself into?

Further reference to the manual enabled me to locate the Mouse/Joystick port. More importantly I found reference to the *expansion connector* on the side of the keyboard. If I could make use of this I felt certain the possibilities would be proportionally greater.

Mertec Compact Companion Assembly

Enquiries lead me to the *Mertec Compact Companion Assembly*. With a name like that I was in business. The pack duly arrived containing the unit. It was a neat compact hollow wedge laminate containing a ROM, with connections to three ports. Two 6mm diameter screws are provided with which to bolt the unit to the keyboard. Note, if, as in the case of the screws I do provide some

technical detail it is because such information has been provided. The instructions came as four photocopied sheets stapled together in one corner. I've heard of keeping the costs down but this is stretching things a little. I found the instructions for fitting clear and precise (except for the left and right hand bit). The accompanying diagram was a very useful adjunct.

The unit is neat and when fitted unobstructive, the cream dappled finish matching the Compact keyboard quite well. The single lead from the unit fits snugly round the back of the keyboard, plugging into the Joystick/Mouse 9 pin D-type plug.

Fitting

Fitting the unit I must say was extremely simple. All one needs is a medium size screwdriver, and a modicum of intelligence and commonsense. The authors are adamant the Compact must not be connected to the computer power supply whilst the unit is being fitted.

Having undertaken the simple task of disconnecting, one turns the keyboard over to find the PCB on the righthand side. This is

the printed circuit board and is referred to as the expansion connector in the Welcome Guide. I am still trying to fathom out why or how it should not be in the same place if I was left handed. As it happens it doesn't really matter as the prime task is to gently push the Companion, after having lined up the gold contacts of the gold connector with the silver tracks, onto the PCB. This required no more than a little even pressure.

Next insert the two screws through the fixing holes, clearly visible in the black angle bracket, and push home. If any difficulty was experienced it was now with the need to ease the white connecting cable to one side to allow the screws to slot into place. At this stage only tighten the screws so as to ensure the unit will not slip and slide. Connect the white lead to the D-type plug at the rear of the keyboard and re-connect the whole to the computer.

Testing

Switch on, if all is well the message on the screen will show in addition to the standard message *Mertec Companion*. Switch off, disconnect, and tighten the fixing screws. If however you do not get the message, disconnect, turn the keyboard over and very gently slide the gold edge connector to the left or right as required. It is most likely only the very slightest adjustment will be needed. Connect up again and check the system. If power up is correct, tighten home the two screws, after switching off and disconnecting.

I have emphasised the importance of isolating the unit from the electricity supply because the manufacturers do so with considerable emphasis, and I believe in safety. Anyway if by not obeying the instructions you blow the whole unit, no comeback!

Taking 'Command'

The user of the Mertec Compact Companion is offered three outlets, the Joystick or Analogue port, the User port and a 2Mhz Bus port. This is to say where one had two before fitting, now there are three.

Preliminary Specification tells one there are three commands in the Companion software. These are *CMENU, *CSTATUS, *CSETUP<RB>. To obtain assistance the software will respond to *HELP followed by one of the above commands, which the authors term *CLI Commands*. All these commands can be abbreviated as long as the minimum is sufficiently long to ensure the correct command is executed. Apparently other software present in the machine could conflict, and the impression I had was one of trial and error. If command conflict does occur revert to the full name or precede the command with an extra "C", eg *CCMENU, "which" one is informed by the *Preliminary Specification* "may help to reduce the problem".

*CMENU displays a ten choice menu. Eight of the options directly control the setting of bits in the configuration byte, while the remaining two allow the user to exit the

Table 1

The Menu Options are:-

OPTION	CHOICE		
	ON	OFF	
7	HARDWARE	Present	Absent
6	SOFTWARE	Select	De-select
5	ANALOGUE	Active	Inactive
4	FIRE BUTTONS	Active	Inactive
3	INTERRUPTS	Modify	Ignore
2	INT STATE	Enable	Disable
1	2 MHZ BUS	Active	Inactive
0	MOUSE	Active	Inactive
	ABORT	Allows exit ignoring any changes	
	EXIT	Exit saving any changes with a further option of making the changed configuration the default status.	

menu either maintaining the most recently revised menu or not. Each option is either operative or non operative, different nomenclature being used depending on the function of the option. The choice is made by use of the cursor keys to position a white bar on the option, then pressing the <Spacebar> or <RETURN>, both of which act as a toggle "on/off". Having moved around the menu making the required amendments, the operator moves to option Exit and presses <RETURN>. A message is then displayed in a window overlaying the menu configuration, offering the choice of the amended menu becoming the default menu or default remaining at the menu existing prior to the most recent amendment.

*CSTATUS followed by <RETURN> displays the current and default configurations in three forms, Binary, Decimal and Hexadecimal. I am sure it is no coincidence that the number of options, other than the 'exits' coincide with the number of bits of a configuration, namely eight. I am certain for the technically minded such information will be most useful. Table 1 indicates the relationship between option and byte.

*CSETUP provides the facility to use the chosen configuration within a program. This statement is qualified in the instructions by "where appropriate". The entry in the program can be in either of the three number base forms. All three CLI commands need to be used in conjunction with each other to be most effective.

A Useful Key

A useful key in the early stages of use, and if you happen to lose the written instructions,

is <TAB> which, when pressed provides, in a window, information about the option in question. Similarly <TAB> used outside the CLI command mode provides instruction as to how to use.

The Problems of Being Ignorant

The "Preliminary Specification" is dotted throughout with technical information, which if still rather a novice, does leave one a little non-plussed. I am assuming at this stage things will be come clearer as time goes by and the Companion is put to 'full' use. Meanwhile I must live in ignorance of the niceties of *FX 16, 0 and the resulting effect on the interrupt overhead.

The claim is the Companion does not make use of user memory except when in CMENU mode. The "safe" area of non-screen ram in the &7E00-\$7E0F is used.

The software makes use of the extended vector (IND3V) which with the Osbyte vector (BYTEV) enables Osbyte calls to be intercepted when ADC is in use. Care is also countenanced if additional ROMS e.g. PMFS, or *FX 22, *FX23 or similar are written into your program.

ROM polling (?) apparently, and I am in no position to dispute it, occurs at centisecond intervals. Similarly an Interrupt is intercepted as "unrecognised Interrupt" ROM service call 5, after indirecting via IRQ1V but before IRQ2V. It also signals an ADC "End of conversion" which allows for handling the Mouse.

The owner is also provided with an example Mouse program, yet to be tried by yours truly.

Tentative Conclusions

It seems to me I have an add-on which has several avenues down which I might well be able, in the fullness of time, to venture.

Hiccups

I do know that care has to be practised now the Companion is fitted, some hiccups have occurred when I have been using View Professional without making certain the Companion is disabled, that is, as far as it is possible so to do.

I hope to do a fuller report on using the Master Compact with Mertec Compact Companion Assembly, I hope not a monster, attached. I did encounter problems with an AMX mouse on the user port, a tap or knock producing some weird results even with the Companion disabled. I am always cautious of making criticism when I am uncertain of the cause for so doing. In this case it seems to me the instructions could have been a little more explicit for the less technically minded.

There are those of us who wish to get on and make use of the equipment we possess rather than be cluttered up with technical detail. Clearer pointers as to what is the

most suitable combination of options from the main menu for each of the ports it seems to me would be most useful. Certainly at the moment it is a matter of trial and error.

Two wheel racers

Compact Crazy Rider Superior Software 3.5" disc £14.95

Probably because of *tempus fugit* the reactions are not so good as they were some, well never you mind how many years back, but I do so easily get bored with looking at the same picture for time on end with little success whilst so doing.

Yes, for the most part the graphics are excellent, particularly the motorcyclists. The landscape is one big bore, no stands or pits flashing by just a backcloth of purple 'snow capped' hills moving across the rear of the picture, which is swathed with a wide green track edged with red and white. How about an option to change the colour scheme on future games releases?

You start on the front of the grid, pole position, the red, orange, green lights flash, a press on * and you're away, with pre race instructions to knock as many of those who are tearing up at you at a rate much faster

than you from behind, off their machines. Green teardrops light up in the top right hand corner of the screen informing you of your success at or lack of dismounting those unfortunate to have run into the back of you!

Meanwhile all those you missed, in my case some 99% of the field, have zoomed passed you. More suddenly they are overtaking you and by some phenomenon I have yet to understand are travelling backwards towards you. This I think is actually you travelling faster than the others but one doesn't get that impression!

Anyway no odds as before you know it you have run into the back of another racer and your bike comes to a virtual stop and you, in one of the versions, tumble over the handle bars. After 30 minutes of trying I was unable to do better than 48th out of a field of 60. To move on to another venue other than LeMans you need to finish in the top seven, something I will have to leave to the more agile. Conclusion: a reaction skill game which I am certain will appeal to many, despite the paucity of graphics detail.

Factfile

● The Compact Companion costs £39.95 inc VAT and is available from Mertec, 35-36 Singleton St., Swansea SA1 3QN ☎ (0792) 467980.

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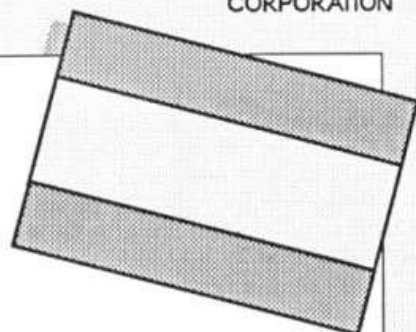
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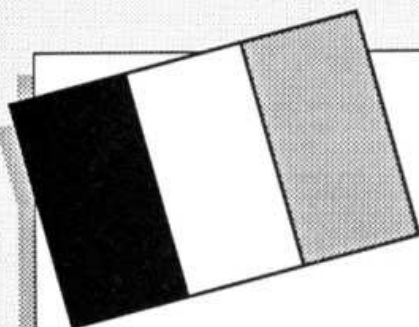
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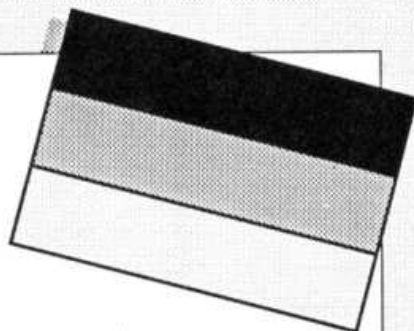
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READ RIGHT!

Software for language skills at all levels

Traditionally, language work in the primary school has been not so much a curriculum area, but more a medium of expression which pervades all aspects of school life. Any discussion on the use of computers and language development must adopt a catholic approach in which the micro is seen as a tool to enhance the growth of language across the curriculum.

The classroom computer contributes to language development by stimulating discussion and logical thought in group, problem solving situations. Word processing, LOGO, simulations and adventure programs provide four key areas which have possibilities for enhancing language work in the primary classroom and have implications for language development. Past articles in A&B Computing have discussed these areas of computer use at some length, so this month I want to look closely at a number of software tools which will assist specific skill development and language teaching. This will involve the examination of appropriate computer use at both primary and secondary phases and a brief discussion of the usefulness of the computer in the *modern languages* environment.

```

Main  1 Teaching section
Menu  2 Diagnostic test
      3 Short practice
      4 Long practice
      5 Final assessment
      6 Vowel weighting/Records
      7 See pictures
      8 Special keys
      9 End
Press ESCAPE for the main menu.
Please type a number
  
```

Figure Two: Sherston's Vowel sounds software.

Much software for primary aged children is written in such a way that the language appearing on the screen is friendly and closely approximates natural language. However, it is important to make the child aware that present day computers are not skilled communicators and that they can only cope with a small subset of the human language. I mention this because much of the software I will discuss this month for the primary age group is intended for children who have experienced difficulty with a number of aspects of language. Children need to be made aware that they must adopt a restricted and formal code in order to communicate with the computer, and that some



Figure One: "Read Right Away", building block programs.

misunderstanding and confusion may occur. Teachers must ensure that the mechanics of the software are not only explained but are fully understood by the pupils.

Skill practice software

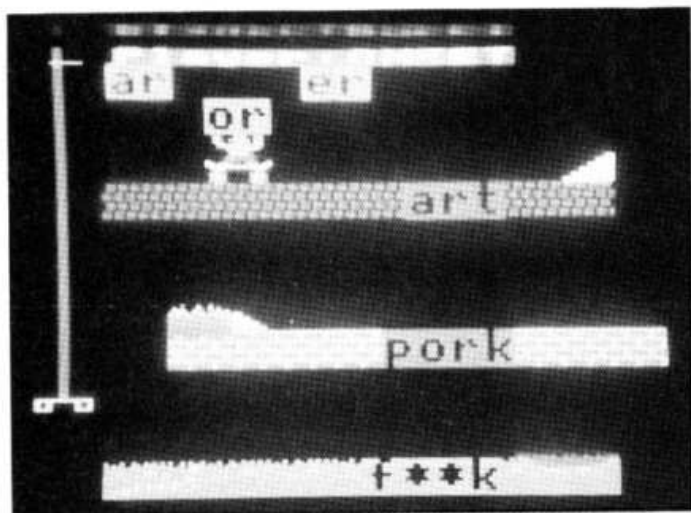
Because skill practice programs are so easy to write, large numbers of them flooded the market four to five years ago when computers were introduced into schools;

Much of this software achieved nothing which could not be done equally well by other means. A typical example was the *Brickup* program which was distributed as part of the *Micro Primer* series. In response to a prompt like '...something to do with teeth' (beginning with 'DEN...'), the program only accepts DENTAL and not DENTIST which is the natural response from the child. It then comes up with the message 'DENTIST is spelt badly' simply because it was not the word that the programmer expected!

At best, this type of software can only test rather than teach, (most do so outside of any meaningful context), and at worst some will even fail to accept perfectly valid answers and will penalise children for their ingenuity and unorthodox answers.

Carefully designed, skill based software does exist, and in the hands of a sensitive teacher such software can form part of the overall strategy in helping children with specific language difficulties. I must emphasize that the use of computer software will only be worthwhile if used in conjunction with a sophisticated diagnostic approach to learning problems. In such cases it is essential that a program is exactly right for the individual child to help with a difficulty that has previously been pin pointed (such as letter discrimination).

This is probably one of those rare occasions when computers are best used with a single child, as the enormous patience of a machine (compared with that of even the most dedicated teacher), is utilized to effect. Sherston Software, ESM, Chalksoft and HS Software are among the publishers who produce skill



based software – Each title described in this part of the article was tested with a mixed ability class of seven year olds. Each program was presented to children whom, it was judged, required specific help in a number of areas.

Boosting reading skills

HS Software produce a series of reading, skill based packs in a series entitled *Read-Right-Away*. The series comprises six packs, see Figure One.

The series is based on the traditional, phonic approach to teaching children to decode words. Each program employs excellent graphics and a simple, but effective user interface. The children perceive each program as a game, but in effect, the practice of reading skills is the core of each program. A feature of the series is the flexibility it offers offering varying options regarding the number of players, the choice of sounds and skill levels.

So popular is this series with the first year junior class, that when it is in use it is difficult to keep other children (who do not require the practice), away! Indeed they felt cheated if they too did not get an opportunity to practise their phonic skills. The superb graphics and sound coupled with a game situation offer enormous encouragement for children for whom reading is a burden.

Similar reading skills are given lively treatment by *Sherston Software*, a company who have established themselves in the education market and have been widely praised by teachers. Among the company's titles are a series of phonic based programs: *Short Vowel Sounds*, *Magic E*, *Consonant Blends*, and *Vowel Diagraphs*, see Figure two.

Each program in this series is designed to provide a diagnostic test, to teach and practise the various skills in the chart above. The teacher can direct a program to test and practise at selected skill levels, and options include diagnostic, practice and final assessment modes. The speed, number of retries and weighting on a particular phonic can be altered.

Typically, the programs are well presented with large lettering, simple and effective graphics and optional sound effects. Although the programs follow a similar *modus operandi*, each offers a unique and varied task, thus proving motivating for reluctant learners. Each program offers an extensive teacher menu allowing total control over almost all the program's facilities.

Each program can be adjusted to suit individual needs. The electronic blackboards are excellent

providing the teacher (working with a group of children), a stimulating and attention holding tool. Every program I have seen from *Sherston Software* has been robust and based soundly on principles of teaching and learning. The programs in this series are no exception.

Boosting spelling skills

One aspect of language teaching which lends itself to computer use is that of spelling. Both ESM and Chalksoft provide solutions to the problems of helping children develop a good spelling sense. Chalksoft's *Spelling your own words* is an upgraded version of their popular *Spelling week by week* software. Chalksoft have not been slow to respond to teachers' demands for a version which will allow them to work on their own sets of words.

The new program provides 10 sets of words, each of which may be replaced by the teacher's list. A teacher's menu (accessed only by password), provides a number of settings to suit individual needs. In practice I have found "Spelling your own words" to be a valuable tool for utilizing the topical approach to vocabulary – ie, in helping children to gain familiarity with "interest" words. ESM's *An eye for spelling* is more suited to developing a sense of spelling in children. Using the "look-cover-write-check" visual approach to help weak spellers, the program provides a list of 3500 words selected and grouped into specific patterns within three broad age groups: 5-7, 7-9, 9-11 years. Each word group teaches a specific letter pattern, for example, the 5-7 years group:

others, brother, mother, another

word groups can be edited, and individual groups can be created to suit individual difficulties. The teacher maintains complete control throughout, and the pupil's progress can be monitored. The program certainly puts some fun back into spelling and children really do gain a sense of achievement.

Dictionary skills for the young

Introducing dictionary skills to young children is often hampered by the fact that "starter" dictionaries often present a single instance to illustrate items; ambiguous information is often an unwitting part of the illustration. A program which helps to overcome the limitations of "first" dictionaries, is *Wordweb* from ESM. The software aims to allow access by children to several illustrations of the key words in different contexts and at any point to break down the sentences into their constituent parts and see them illustrated.

Thus, ambiguity inherent in single illustrations is reduced – naturally, the whole of the Oxford Junior Dictionary cannot be represented visually by the BBC Micro as it stands, however, to describe *Wordweb* as only a "dictionary" program is to render it a disservice as it is more like a mini thesaurus in reality. ESM have produced four theme discs for children to explore: *The Home*, *The Street*, *The Farm*, and *The Zoo* which approximates most children's widening horizons! Each theme has about 40 key words divided into various types: people, places, animals, verbs and so on.

Through the use of text (in the present tense), children are lead by reference to simple, block graphics and S.V.O. (subject-verb-object), sentences to process simple textual information. A particular pathway through the program can be directed by the teacher (most successfully in teacher led, small group activities), or by the children themselves. Inputs from light pens and Concept Keyboard are accepted and

a child's list of sentences and key words can be dumped to the printer. As an open ended database and a means of stimulating and clarifying ideas for writing, Wordweb is most successful. It proved popular with the class of first year juniors.

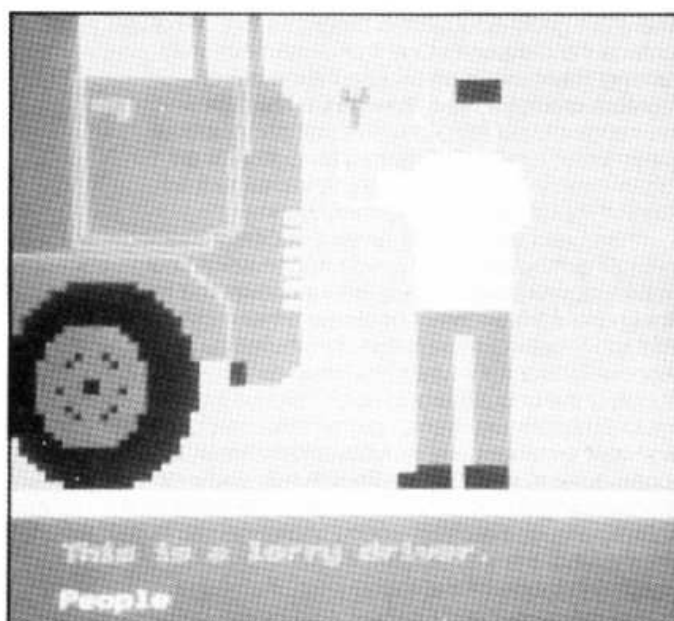
In the primary school, talking, listening, reading and writing are all integral parts of the way young children learn. The computer equipped with interesting and challenging software such as that described above has a valuable place in the schema. The secondary school, as mentioned before in these columns, provides a far different environment. Matters of equipment provision, software support, curriculum constraints and teaching method constrain the way that the computer may be used much more than in the primary school. Her Majesty's Inspectorate spend a good deal of time expounding the "primary ideal" to secondary teachers – that is, the topic based, group work approach to which computer materials are so

group of students with a holiday at a French coastal resort. The object of the exercise is to survive in France! Consequently a variety of situations occur which demand that the pupils use the language to manage their lives.

This package enables users to investigate their environment, as they will. As this environment is a real place in France it is possible to develop a whole selection of sideways routes out from the software that develop an understanding of the culture of that area of France. The language is not the sole objective of such work although it is obviously very important.

The question also arises, "When do we use this material?" The answer is, whenever it becomes appropriate. The user need not be limited by times of lessons or even the context of a particular course. Children needing development work in survival French may be pointed at this software, even if it is not used anywhere else! Revision work and topic based work for less able groups all have their place. The great shame is that this is only one context in a whole variety that are possible in a language.

A series of such programs could cover many aspects of the modern languages "survival" syllabus in an attractive and easily managed way. The other beauty of this type of theme based package is where schools actually talk to each other, there is the possibility of exchange of materials which build up into huge resource packs in very little time at all. These multimedia offerings often grow up because of the



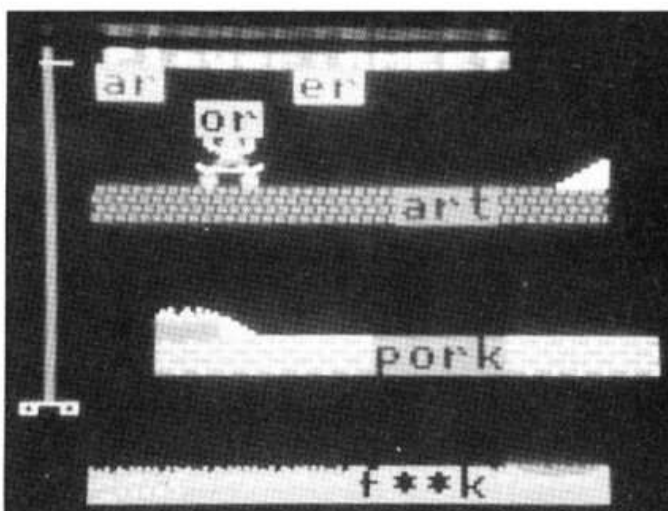
admirably suited.

In the secondary environment however, that ideal is even more difficult to attain than in the primary school. If the school is a formal or traditional environment then it is certainly true to say that the teacher who dares to be adventurous is likely to find that the situation can get out of hand. Furthermore, although a topic based approach may be appropriate, other departments on whom the topic impinges probably have little or not connection with the department in question.

Communication is sufficiently difficult within "faculties". cross faculty communication is still almost a taboo in many schools, although this is becoming less the case.

Modern languages are a case in point; an appropriate mixture of curricular areas would be modern languages, geography and history with the odd sprinkling of English. Much software available for languages would be better exploited in that type of mixed market because different aspects of the study of a culture, other than just its language, would be possible. This would mean that the learning of all these aspects would be in context.

A fine example of this would be **Granville**, Cambridge Micro Software's "Prize Holiday Package". This excellent piece of material which should be available to every teacher of French, presents the



efforts of one or two teachers whose imagination is fired by the possibilities of a particular program.

At this point, it is worth mentioning an excellent book which will provide a wealth of information for computer users in Modern Languages. *Using Computers in the Language Classroom* by Christopher Jones and Sue Fortescue brings together a great deal of information about the use of the micro in many language situations. It covers everything from word processing and desk-top publishing, through "authoring" packages (dreadful name!) to language drills and exercises. It is critical, objective and keeps a firmly educational head on its shoulders.

Words Words Words...

Strangely enough, modern languages is not a subject area that lends itself comfortably to many aspects of computer use. In common with maths, there is little really good dedicated software. The best practice seems to be generated by people's use of computer

tools which are sufficiently open ended to allow them to be used for almost anything. A fine example of this would be the word processor. However, here we immediately fall foul of a huge problem – namely the ability or rather inability of BBC micros to generate a foreign language character set.

A flexible package called *Btype* allows the user to type in one of about five languages, and mathematical and scientific symbols. Unfortunately, there is only room for two or three pages of text in this word processor because of the memory overheads. Moreover, printing is very slow. Now this is probably one of their better packages – certainly in the earlier days of computing. It still has a great deal going for it, and I recommend it as a piece of software for all schools' software libraries.

Another package on similar lines is **Folio** from Tedimen Software. Folio has already found a place in many people's hearts as a primary word processor. With its clear text and variety of printouts it is easy to use, powerful and fun. Tedimen have done modern language versions of this package which include European characters and Asian character sets.

In an ideal world every child would have access to his or her own WP package. In reality we do not even have one micro per classroom! Another tool which is of interest but again fraught with problems is the French **Teletel** Service. This is somewhat similar to our Prestel system in that it is a videotex database and communications system. A huge amount of material of use to language teachers is available on this system, although it should be said that it must be used with some care – there are areas of the Teletel network that would make a sailor blush! If that is an encouragement to you to go and try it out then you will need appropriate software in order to gain access to the system.

Two packages are available – **Collnet** from Harrogate College of Arts and Technology and **Teletel** from Aldoda International. The former is disc based whereas the latter is supplied on ROM.

In many authorities communicating from England to France is still not possible, although we live in hope of some sort of initiative from the Department of Trade and Industry who kindly gave authorities all the modems which are, at the moment, mouldering in store cupboards, rapidly running out of warranty. The easiest way around this particular argument is to do all your work from home, save it to disc and integrate the screens into some other system such as *Communitel* or *Micro Viewdata*. You will be unlikely to recoup your expenses however and, more importantly, you will need to know what you are doing in order to build your suite of screens into a useful format for the classroom. Local authority computer centres with the guidance of modern languages groups should be able to do a good job of this sort of work if they have the facilities and the inclination.

The nitty gritty

In terms of the nitty gritty world of grammar, structure and syntax, many teachers feel that it is appropriate to use the computer as a practice machine.

The most drab exercise can be livened up to encourage the user to sit down and plod through the nuts and bolts of a language. The second reason put forward for not using the computer is that it deals only with *written* language and cannot ever have an interface to the spoken word directly. BBC Soft have countered this with one of their two modern languages

programs. **Deutsche Direkt** comes complete with an audio pronunciation tape.

Deutsche Direkt and its companion **A vous la France** supply teachers with a ready-made kit of imaginative exercises that can be slotted into the work of a class at any point. Although nominally tied to the BBC language courses of the same name, the materials are fairly broad in their application and may be used in conjunction with any course material.

There are many programs around from a variety of publishers claiming to perform tasks that the teacher ought to be doing. Unfortunately, as with all subject areas, there is a great deal of cross around; vocabulary rehearsal programs are notoriously bad, (tedious and uninspiring), yet they seem to make the educational best seller charts frequently, this is because these charts are based on high street sales and not on school purchases.

We are seeing the effect of the demand by parents for educational products which are being serviced by something that many will find totally unacceptable. There are good educational programs that are of use outside the classroom. One that I shall mention in closing strikes me as an excellent example of contextualised software. **French On The Run** which was originally published by Silversoft and has now been taken over by Database Publications is an adventure game in which the user is a pilot of an aircraft shot down over occupied France.

The object of this adventure is to reach Marseilles without getting caught. This will happen when your knowledge of the language lets you down. The fine thing about this excellent package is that most of the text is in English. The key points are where you encounter situations where you must converse with the locals or the occupiers and each situation is based around a particular French grammatical problem. This software provides an enjoyable context for GCSE candidates to practise their French skills and learn some boring grammar in a fresh way. The adventure is fast moving and exciting – and I challenge you to get through it all the way first time, even if you do have a degree in modern languages!

Factfile

- HS Software can be contacted at 56 Hendrefoilan Ave, Sketty, Swansea, West Glamorgan, SA2 7NB.
- **Short Vowel Sounds, Magic-E, Consonant Blends** and **Vowel Diagrams** are all available from Sherston Software 8 Court St, Sherston, Malmesbury, Wiltshire. SN16 0LL.
- **Spelling Your Own Words** is available from, Chalksoft Ltd, PO BOX 49, Spalding, Lincs. PE11 1NZ.
- **An eye for spelling** and **Wordweb** are both available from ESM, Duke St, Wisbeach Cambridgeshire. PE13 2AE.
- **Granville** is available from Cambridge Micro Software, c/o Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge, CB2 2RU.
- **Folio** is available from Tedimen, PO BOX 23, Southampton.
- **Teletel** is published by Aldoda International, 201 Haverstock Hill London NW3 4QG.
- **Deutsche Direkt** and **A Vous la France**, are both available from BBC Enterprises, Woodlands, 80 Wood Lane, London, W12 0TT.
- **French On The Run** is currently available through Database Publications, Europa House, 68 Chester Road, Hazel Grove, Stockport, SK7 5NY.

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PRODUCT CODE NUMBERS

PROGRAM TITLE	BBC B+B	MSTR 128	COMPACT	ELECTRON
Global View	DB01	DB16	DB33	DE06
Graphics Pack 1	DB03	DB17	DB37	DE01
Musician	DB06			
Mode 7 Utilities	DB12			
Adventurescape III	DB20	DB28	DB35	
Combat Zone	DB21		DB32	
Easy Font	DB26	DB39	DB44	
ADFS Menu		DB27	DB31	
Graphics pack 2	DB28	DB34	DB38	DE38
Colour Ikon	DB36			
A&B Bibliography	DB40	DB53	DB54	
Statistics	DB41	DB42	DB43	
Games Compendium 1				DE45
Home Office	DB46			DE46
Graphics Constr. Set	DB49	DB50	DB51	
Compact 100			DB52	
Bibliography Upgrade	DB55			
Master Only		DB56	DB57	
A&B '87	DB58	DB59	DB60	
Getting Into Assembler	DB61	DB62	DB63	
Wordwise Plus	DB64	DB65	DB66	
Sideways RAM	DB67	DB68	DB69	
Pascal	DB70	DB71	DB72	
Adventure Special	DB73	DB74	DB75	
Graphics Special	DB76	DB77	DB78	
Skywatcher	DB79	DB80	DB81	
Online!	DB82			
Disk User One	DU1			

AVAILABILITY AND PRICE

Name	Product	40(small)	80(large)	Price	Compact 100	DB52	no	yes	£15.00
Global View	DB01	yes	yes	£10.00	Bibliography Upgrade	DB55	yes	yes	£5.00
Electron + 3	DE06	no	yes	£12.00	Master Only ADFS	DB56	yes	yes	£6.00
ADFS	DB16	no	yes	£10.00	Compact 3.5"	DB57	no	yes	£7.00
Compact 3.5"	DB33	no	yes	£12.00	A&B '87	DB58	yes	yes	£6.00
Graphics Pack 1	DB03	yes	yes	£10.00	ADFS	DB59	yes	yes	£6.00
Electron + 3	DE01	no	yes	£12.00	Compact 3.5"	DB60	no	yes	£7.00
ADFS	DB17	yes	yes	£10.00	Getting Into Assembler	DB61	yes	yes	£6.00
Compact 3.5"	DB37	no	yes	£12.00	ADFS	DB62	yes	yes	£6.00
Musician	DB06	yes	yes	£6.00	Compact 3.5"	DB63	no	yes	£7.00
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ADFS Menu	DB27	yes	yes	£12.00	Adventure Special	DB73	yes	yes	£20.00
Compact 3.5"	DB31	no	yes	£14.00	ADFS	DB74	no	yes	£20.00
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ADFS	DB53	no	yes	£15.00	Compact 3.5"	DB81	no	yes	£7.00
Compact 3.5"	DB54	no	yes	£15.00	Online!	DB82	yes	yes	£10.00
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Electron + 3	DE45	no	yes	£12.00					
Home Office	DB46	yes	yes	£10.00					
Electron + 3	DE46	no	yes	£12.00					
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As well as full on screen instructions, the package comes complete with necessary documentation. The whole suite is a uniquely educational and enjoyable package for the BBC Microcomputer, Model B, B+ or Master 128 (this version supplied on one ADFS disc). On two DFS discs for just £10.00.

A single disc Electron +5 version of the suite contains all the above but not the animation facilities, which the hardware does not support.

Musician

Musician is a suite of programs to help you compose, edit, store and play sounds and pieces of music on the BBC. The main program employs the Creative Sound Language with which you may compose or copy tunes to incorporate into your own programs. A further module allows the music to play in the background while loading a game. Example data include classical and modern pieces.

Supporting programs are Soundstore – an electronic library of envelopes and sound statements, Player – which turns your BBC into an electronic keyboard with digital recording, editing and playback and Composer – a music editor with standard musical notation on screen. Other musical examples are included. Make music, get Musician!

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Easyword – fully fledged wordprocessor with sophisticated text formatting and printer control. Headers, footers, page numbering, search and replace, block move and replicate, status information, all you need from a wordprocessor. **Desk Diary** – full diary facilities with search dates, key string search, full diary description per entry and browse facility. Desk Diary is so quick in operation that it actually makes using a computer based diary a practical possibility. **Notepad** – quick 80 column memopad. **Financial Manager** – bank and savings account processing. **Mail List** – a database program tailored for mailshots. **Forms printer** – a range of programs which produce invoice and delivery notes, statements, orders and credit notes. Menu driven and very easy to use.

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The ADFS Menu is a sophisticated menu utility for ADFS discs on Model B/B+ or Master 128 computers. The Menu becomes active automatically when a disc is booted. Files and sub directories are displayed along with other system information. Just move around the files with the cursor keys or 'games' keys and highlight the file required.

The menu handles files in an intelligent manner. BASIC, machine code and text files are treated appropriately. If View or Viewsheet is fitted then the software will be entered automatically and the file loaded. Sideways ROMs can be saved to disc and ROM images loaded into sideways RAM banks and automatically installed. This is an essential utility for Master 128, Master Compact (faster than the Desk Top) and Model B with ADFS fitted. The Menu will operate on floppies (5.25" or 3.5") or Winchester discs.

● BBC Model B/B+ (with ADFS)/Master 128 disc £12.00 Order product number DB27

● Master Compact 3.5" ADFS disc £12.00 Order product number DB31

Example files are included on the disc as well as full instructions and the source code in ADE.

Archimedes Software

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Adventurescape Upgrade	DB87	£5.00
Global View	DB88	£10.00
Global View Upgrade	DB89	£5.00
Easyfont	DB90	£10.00
Easyfont Upgrade	DB91	£5.00

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Bibliography

The A&B bibliography turns your collection of A&B Computing magazines into a valuable reference work. The bibliography now covers May 1983 to May 1987.

1983-87 Model B, B+, Master 5.25" DFS £15.00

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Full instructions for both studios are supplied in an accompanying manual.

● Model B/B+ disc £10 Order product number DB49

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● Master Compact 3.5 disc £12 Order product number DB51

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● BBC Master 128 ADFS disc £10.00 Order product number DB17

● Electron +3 disc (Ikon/Ikon Utilities/Cadpack) £12.00 Order product number DE01

● Master Compact 3.5" ADFS disc £12.00 Order product number DB37

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The following Soft Sale products are all available for the Master 128 or Compact (for full details see the individual entries in the Soft Sale):

● Graphics Construction Set

● ADFS Menu

● Easy Font

● Combat Zone

● Global View Suite

● Adventurescape III

● Graphics Packs 1 and 2

The following DFS format discs are also compatible with the Master 128:

● Musician

● Mode 7 Utilities

And NOW, there's the COMPACT 100

100! programs for the Master Compact including arcade and adventure games, programming and business utilities, educational software, graphics, music and Mode 7. One and a half megabytes of software on two 3.5" ADFS discs. Master Compact only.

● BBC Master Compact 3.5" discs (2) £15.00

Order product number DB52

Master Only

Software to take advantage of the sideways RAM and enhanced graphics available on your Master 128 or Master Compact. Includes:

Fast Copier – quickest backing-up we've seen in all filing systems: DFS to DFS ADFS to ADFS DFS to ADFS

Eastern Promise – creative GXR graphics **Charts 'n' Graphs** – bars and pies with user defined shading **GXR demonstrations** – maps, window scrolling, animation,

starting points for your own programs.

Master 128 ADFS 5.25" £6.00

● Order product number DB56

Compact 3.5" £7.00

● Order product number DB57

Graphics Pack 2

Graphics Pack 2 is a single disc packed with graphics based programs published in A&B Computing. We think it represents superb value. Whatever your interest, Graphics Packs 1 and 2 should now offer you an opportunity to experiment with computer graphics.

Graphics Pack 2 for the Model B and B+ contains all the programs bar the Master Graphics set. The Master 128 and Compact versions both come in ADFS format, allowing us to pack a considerable number of example screens and extra programs onto the disc. All the programs are documented in an accompanying manual.

Create your own **letter heads/badges** from any picture in any graphics Mode with Retouch of Class.

Master 128, Compact and GXR (Graphics Extension ROM) owners can investigate their micros' **advanced graphics** facilities with shadow RAM switching, flood fills and scrolling windows.

Sketcha lets you design your own graphics for quick and easy incorporation into your own programs. Graphics for art's sake. A multitude of **Islamic patterns** for screen or printer presentation. Screen dump provided.

Tangrams – a fascinating oriental approach. Move the shapes into position, juggle colours and change angles.

- Model B/B+ disc £10 Order product number DB29
- Master 128 with ADFS £10 Order product number DB34
- Electron +3 disc £12 Order product number DE29
- Master Compact 3.5 disc £12 Order product number DB38

Easy Font

This range of attractive fonts is supplied on one 80 track or two 40 track disc(s). There are eight fonts in all, choose from: Old English, Cloister, Tea Chest, Folio, Futura, Old Towne, Japanette and Corvinus.

The fonts are controlled from BASIC. Example routines and instruction for use are given for each font.

- BBC Model B/B+ £10.00 Order product number DB26
- BBC Master 128 ADFS disc £10.00 Order product number DB39
- Master Compact 3.5" disc £12.00 Order product number DB44

ADVENTURESCAPE – THE ADVENTURE WRITING SYSTEM FOR DISC BASED SYSTEMS

Adventurescape is supplied on two floppy discs.

Disk One: Adventurescape adventure generator locations descriptions puzzles dungeon adventure tutorial to be used in conjunction with the 20 page manual packaged with the software **Murder at the Abbey**, the classic whodunnit

Disk Two: Amnesia, massive adventure **Xanadu**, based on Coleridge's *Kubla Kahn* poem

Adventurescape III

Adventurescape is an adventure writing system for disc based BBC Microcomputers (all series). The system consists of a 'shell' program which will run any one of a number of different adventure games, and two utility

programs which provide friendly menu-driven editors to allow people to create the data files for a game of their own design. The system is unique in treating all the content of the game as a database – including the puzzles. This means that it is comparatively simple for anyone to use and no programming expertise is required.

The adventure games which can be created include the following features:

- (i) Up to 250 locations and 250 messages can be used. The descriptions may be lengthy and the total text far exceed the memory capacity of the computer, since these files are accessed directly from disc while the games are run.
- (ii) A range of Mode 7 coloured text is used to distinguish different types of message, eg location descriptions, general messages and inventory lists.
- (iii) Locations are connected by pointers allowing one way exits, twisty passages, mazes etc to be constructed.
- (iv) Objects may be examined leading to messages which expand upon their usual description.
- (v) A very wide range of puzzles may be constructed using the unique puzzle generator of Adventurescape as will be explained in detail below.
- (vi) Players may SAVE and LOAD game positions under their own choice of filename as often as required.

What is more, this package includes no fewer than three sample games written with the system: **Murder at the Abbey**, **Lost in Xanadu** and **Amnesia**, in addition to the files of a short demo game 'Dungeon' whose construction is explained as a fully worked example in the manual. A utility for squashing text files once a game is complete is also provided. Text from Adventurescape can be exported to the Robico Midge Compression System.

- BBC Model B/B+/Master disc £15.00 Order product number DB20
- BBC Master ADFS disc (utilises sideways RAM) £15.00 Order product number DB28
- Master Compact 3.5" ADFS disc £17.00 Order product number DB35

A&B SOFT SALE ORDER FORM

PRODUCT NAME	PRODUCT NUMBER	DISC Please specify 40 or 80 track (ADFS equiv. Small & Large)	QUANTITY	PRICE
TOTAL				

Name

Address

Postcode

Signed Date

I enclose a cheque/postal order made payable to **ASP** for £
Please complete the form in block capitals and send it with your remittance to Software Sale, Reader Services, 9 Hall Road, Maylands Wood Estate, Hemel Hempstead, Herts HP2 7BH. Tel: 0442 211882.
You can direct technical enquiries about software to the suppliers on 0733 53355.



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There's no disputing the fact that Panasonic make a range of extremely reliable printers.

We've proved it by testing them in temperatures that would make other printers grind to a halt. It's the high standard of design, manufacturing and quality control which goes into every Panasonic product that makes our printers so reliable.

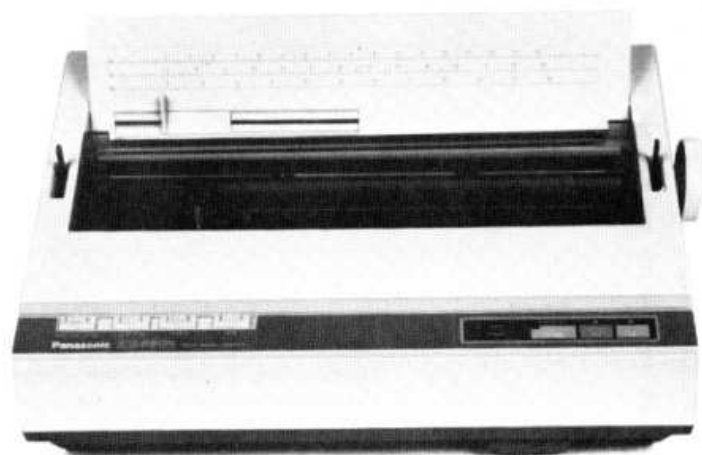
But reliability isn't at the expense of performance.

The KX-P1081 Dot Matrix model, for example, zips through your documents at 120 characters per

second, or you can switch it to print excellent near letter quality results.

Alternatively, if you want to go all out for quality, the Panasonic KX-P3131 Daisy wheel prints at a busy 17 characters per second.

The results were impressive



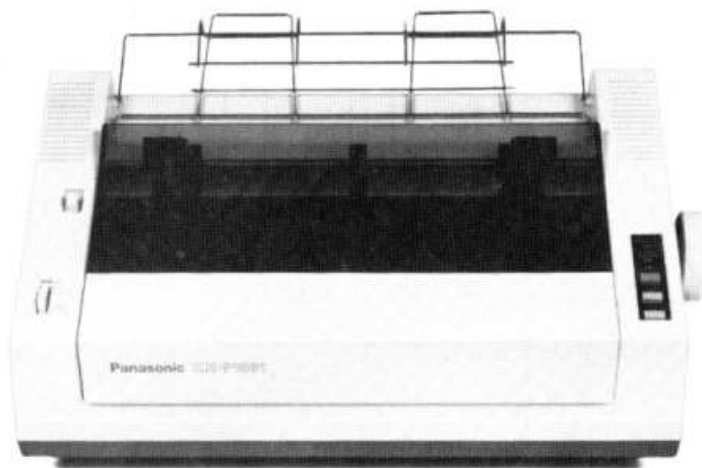
printers won't u broke.

enough to scoop a coveted "Best Buy" award from "What To Buy For Business Magazine."

Naturally all our printers are compatible with almost every computer and software package available. And there can be no

argument about the price, which leaves just one thing to be resolved. Which Panasonic do you choose?

Clip the coupon below or call Julie Everard for more information about the full range of Panasonic printers.



DAISYWHEEL PRINTERS: KX-P3131 (17 CPS, 120 COL.), KX-P3151 (22 CPS, 132 COL.)

To: Panasonic Industrial UK Limited, 280-290 Bath Road, Slough, Berkshire SL1 6JG. Telephone: Julie Everard on 0753 73181. Please send me details on the full range of Panasonic printers.

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2/88

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The choice
of Experience



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before and after
the experience

Archimedes micro

The Acorn Archimedes range of microcomputer comprises of four machines – the 305 and 310 with 0.5 and 1 MB of RAM, and the 410 and 440, with 1 and 4 MB. All have 0.5 MB of ROM and one 3.5" floppy disc drive of 800K as standard. The 440 also has a Winchester drive of 20MB – all mounted internally.

They have separate keyboard and a three button mouse as standard. The Keyboard is compatible with the new IBM ATE layout, with 12 function keys.

The standard display is a high resolution mono colour monitor. A colour, multifrequency monitor is optional.

The screen modes include:
● 80 × 25 or 32 characters, in 2, 4 or 16 colours for wordprocessing, etc.

● 132 × 25 or 32 characters, for spreadsheets, etc.

● Up to 640 × 256 dots × 256 colours (with single frequency monitor) and up to 640 × 512 dots × 16 colours (with a multi frequency monitor), for graphics, etc.

The sound system can have up to eight channels playing at once, from up to 32 instruments or voices, using waveform synthesis and stereo output.

The outlets for the monitor, printer, serial port and audio are all at the rear, and have industry standard connectors.

The 410 and 440 have a backplane for four expansion modules and the circuitry for a Winchester disc drive as standard.

The complete operating system – including Window Manager and Desktop – is in 0.5 MB of ROM. It can access directly all the RAM that can be fitted (up to 4 MB).

The Advanced Disc Filing System uses robust, pocket-sized 3.5" discs with a new 800K format, but also reads, writes and formats the 640K discs used by the Master series. As well as 25% more capacity, the new format allows almost four times the data transfer rate.

A battery-backed clock-calendar, and CMOS RAM to hold configuration setting is standard.

Expansion is via internal plug-in boards (modules), which connect with the backplane.

ARCHIMEDES PRICES

305 Series

- Entry System £699
- with Green Monitor £749
- with Colour Monitor £899

310 Series

- Entry System £775
- with Green Monitor £825
- with Colour Monitor £975

310M Series

- Entry System £835
- with Green Monitor £885
- with Colour Monitor £1035

410 Series

- Entry System £1399
- with Green Monitor £1449
- with Colour Monitor £1599

440 Series

- Entry System £2299
- with Green Monitor £2349
- with Colour Monitor £2499

- 0.5 Mb RAM for 305 £85
- Podule Backplane £37
- ROM Podule £37
- Archimedes Ref Manual £20
- ARM Assem. Lang Prog Manual £12

(Securicor carr. £7 on Micros)

Podules expected this year (from Acorn unless stated) include:

- 2nd 800K floppy disc drive (for 305, 310 & 410) £125
- Econet Network Board £43

A Computer for BUSINESS, RESEARCH, EDUCATION & HOME USE

- Backplane for 2 modules, with fan (305, 310) £49
- I/O Podule (with User port, Analogue port & 1MHz bus) £79
- MIDI add-on to I/O Podule £29
- ROM Podule (takes five 8 bit ROMs, of 16, 32, 64 or 128K) TBA
- Modem Podule (Beebug) TBA
- Real time Video Digitiser (Watford) TBA
- Sound Sampler (Armadillo) £78
- Speech Podule (Tubelink) TBA

Due in the 2nd quarter 1988

PC Podule, with 10 MHz 80186, 640K and floppy disc interface, (for all models). This should run about 3.5 times as fast as an IBM-PC. Fully IBM compatible.

SPECIAL OFFER

With every Archimedes Micro purchased from us, we are giving away absolutely **FREE** a 5¼", double sided disc drive with PSU, (1 Megabyte unformatted), plus the special Archimedes interface cable, worth £125.
(P.S. This offer does not apply with 0% finance scheme mentioned below).

0% (APR) FINANCE

For a limited period, Watford Electronics are able to offer the Archimedes range of microcomputers at 0% (APR) finance. Credit facility available for up to 12 months, subject to status. Please inquire for further details. (Watford Electronics are Licenced Credit Brokers)

NEW

CREDIT TERMS now available.
Please telephone or write in for further information.

What Archimedes does and can do

The software on the welcome disc includes four applications.

"PAINT" is a simple mouse driven art package, operating in the 640 × 256 × 16 colour screen mode. Images can be produced without any programming and saved to disc for use elsewhere.

The sprite editor allows sprites to be created pixel by pixel in the 640 × 256 × 16 and 256 colour screen modes. It can also be used to edit pictures from "Paint". The results can be used in Basic programs for animated graphics.

The Font Designer allows you to design individual letters and symbols – and save them together as a font. They may be "anti-aliased", for even better appearance on screen.

The Music Editor allows you to enter music in standard notations, with up to four "parts", and save it to disc. It may be played via the internal speaker (in mono) or via external headphones or hi-fi (in stereo). The voices or instruments (of which there are nine as standard), and their volume, tempo and stereo position may all be varied while playing.

BBC Basic 5

This is upwards compatible with earlier versions, so most programs written in them will run – though far faster. Even using a 305, up to 370K is available in Basic. It also affords access to all the new graphics, windowing and sound facilities – as shown by the applications on the

Welcome Disc. As well as being in the system ROM, BBC Basic 5 is provided on disc for loading into RAM because it then runs about 40% faster. This speed makes it the **FASTEST MICRO IN THE WORLD**. BBC Basic 5 includes an in-line Assembler.

WORDPROCESSORS

- Wordwise + £20
- Image-Writer £26
- Interword ROM £39
- View £50

DATABASES

- System's Database £26
- Alphabase £43
- Viewstore £52

SPREADSHEETS

- Intersheet ROM £39
- Viewsheets £50

BUSINESS GRAPHICS

- Interchart ROM £25
- System's GammaPlot £30

INTEGRATED PACKAGES

- Logistix – Database, Spreadsheet time management & Business Graphics £99

ACCOUNTS PACKAGES

- Medow Computers' suite of 4 Modules
- Minerva's suite of 5 Modules P.O.A.

ART & DESIGN

- Artisan £34

GAMES

- Zarch £17

EDUCATION

A great many packages are expected in early 1988. The topics include: Business Studies, Maths, General Science, Biology, Physics, Chemistry, Economics, Geography, History & Music.

PC EMULATION

The Acorn PC Emulator (for 310, 410 & 440), includes MS-DOS 3.21 and is available NOW at £99. It runs most MSDOS and many PC-DOS applications (which number over 10,000). Compared with IBM PC, this all-software emulator can calculate about half as fast, and write to the screen about a quarter as fast. This makes it more suitable for running spreadsheets (such as Lotus 1-2-3) than wordprocessors (such as Wordstar). However it includes utilities for copying disc files between DOS and ADFS formats, so that data may be transferred to and from Archimedes applications. The 3.5" discs used by the new IBM PS/2 models, and by many DOS portables, may be read, written and formatted directly. 5.25" discs require an additional, external drive, which is available as an option. The PC Podule (due second quarter '88), will run very much faster.

£99

LANGUAGES

Acornsoft ANSI "C", ISO-Pascal, Fortran 77, Cambridge LISP and PROLOG X are all available now at £95 each, as is the Twin Editor, at £29. These require at least a 310. The ANSI "C" affords access to all the graphics, windowing and sound facilities of the Archimedes and executes at exceptional speed – 14 to 26 times that of a PC, 5 to 10 times that of an AT, and as fast as most 386 machines. (For demonstration, call in at our retail shop.

If you require technical literature, then simply telephone us).

Archimedes to BBC SERIAL LINK

Using this simple data link, it is possible to solve all your BBC to Archimedes data transfer problems. The kit is supplied with two disks, one 5.25" for the BBC, the other 3.5" format for the Archimedes, and the necessary cable to connect the two computers. Using this package it is possible to transfer any data from the BBC to Archimedes at upto 19200 baud. By far the easiest way to transfer data to your new computer.

Only £25

Archimedes 5¼"/3½" Disc drive Interface

With this interface it is possible to connect almost any 5¼"/3½" disc drive with its own power supply to the Archimedes. Up to FOUR drives can be connected and NO SOLDERING is involved. Supplied complete with necessary lead.

Only £25

Note: This is not simply a lead. Attempting to connect an external disc drive by direct connection may result in damage to your Archimedes.

BBC MASTER

BBC MASTER 128K Micro incl.
Acorn's: View, Viewsheets, ADFS,
BASIC Editor & TERMINAL **£379**

SPECIAL OFFER

FREE... £105 worth of Hardware & Software

Gemini's OFFICE MATE & OFFICE MASTER packages on Disc consisting of: Database, Spreadsheet, Beebplot graphics, Accounts packs: Cashbook, Final Accounts, Mailist, Easyledger, Invoice & Statements, Stock Control and Watford's 3½", double sided 1 Megabyte (unformatted) single disc drive complete with cables, ready to connect to the micro - with every BBC Master purchased from us this month.

BBC MASTER with Turbo Board + above SPECIAL OFFER £475

512K Processor Add on Board "inc. Mouse and GEM package" £185

BBC AIV (Domesday) System £4479

ADD-ONS & ACCESSORIES

Turbo 65C102 Add-on Module	£95
Econet Module for the Master	£40
Twin ROM Cartridge for Master	£7.50
Quad ROM Cartridge for Master	£12
Universal Processor Adaptor	£75
Reference Manual I (No VAT)	£14
Reference Manual II (No VAT)	£14
Advance Ref. Manual (No VAT)	£19
64K Upgrade Kit for B+	£32
Acorn 1770 DFS Kit complete	£41
ECONET Upgrade Kit for BBC	£42
ALL ECONET UPGRADES Available	
280 Acorn 2nd Processor package	£325
ARIES' Professional IEEE Interface	£238
Acorn IEEE Interface Complete	£265
Morley Teletext Adaptor with ATS Rom	£99

BBC MASTER COMPACT

All Master Compact Microcomputers are supplied complete with an integral 3½" Disc Drive and various educational and professional bundled software.

System 1	Standard Package	£310
System 1A	System 1 + TV Modulator	£322
System 2	System 1 + Green Hires Monitor	£364
System 3	System 1 + Medium Res Colour Monitor	£478
RS232 Kit for BBC Compact		£25
Additional 3½" Drive for BBC Compact (Securicor carriage £7)		£90

CO-PRO Adaptor



Now for the first time you can add the Master Co-processor boards, to your standard BBC model B, or B Plus. With this brand new launch from Watford Electronics you can attach any BBC Master co-processor to the original BBC Micro. Once again Watford strides ahead with a new concept in BBC B Micro add-ons. This unique external Co-Pro Adaptor, is protected by patent applications.

Use the super fast Turbo Board with your BBC B, it is much faster than the 6502 2nd processor superseding it. With the 512K add-on your standard BBC machine achieves IBM PC compatibility at a realistic price running GEM, Lotus 123 and many other programs. Included with the 512k package is a high precision mouse and the Digital Research GEM suite of software; GEM Desktop, GEM Write, GEM Paint. This requires both the 1770 DFS and the ADFS to be fitted to your computer.

To use other co-processors you require a BBC B with DNFS 1.20 or higher, or BBC B+ fitted with 1770 DFS 2.20 or greater. Co-processors work exactly like a second processor. Master owners may use Co-Pro to add a second Co-processor externally.

Watford, brings power to your BBC at only:

£35 (carr £5)



CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

The 80186 Co-Processor

This package consists of the Master 512 board, Watford Co-Pro Adaptor, 1770 Disc Upgrade and Acorn ADFS. The Master 512 board using the 80186 16 bit Processor at 10MHz and running Digital Research DOS Plus, gives a high degree of IBM compatibility at an extremely reasonable price. Included in the 512k package is a mouse and the amazing Digital Research GEM suite of software; GEM Paint, GEM draw and GEM desktop giving a complete Mouse Icons environment (All other GEM packages will work on the 512k). Famous packages that will work with the 512k board include Wordstar, Dbase II, Lotus 123 and many others. The only requirement to upgrade any BBC Model B to this system is you must have twin 80 track disc drives.

£259

65C102 2nd PROCESSOR

This amazing package consists of the Acorn 65C102 'Turbo' Board, the Watford Co-Pro Adaptor and Acorn 1.2 DNFS ROM. The 'Turbo' board, running at 4MHz with 64k of additional RAM will increase the speed by between 50 and 200% depending on the application running, and allow a BASIC program of upto 44k in any screen mode. Simply by plugging in the Co-Pro and the DNFS ROM with its special Tube host code and you massively increase the power of any Model B.

£135

SPECIAL OFFER

EPROMs for BBC's Sideways ROMs

2764-250ns £3.00

27128-250ns £3.50

RAMs (Low power) for ATPL, WATFORD, etc.
Sideways ROM Boards

6264LP (8K) £2.50

2 x 6264LP (16K) £4.80

NEW Z88 Sinclair's Portable Micro

Watford Electronics announce a very special new - and affordable portable microcomputer, tailor-made for the BBC Micro user on the move - the Cambridge Z88.

The Cambridge Z88 is a versatile portable micro, bursting at the seams with built-in software ready and waiting for you to use at the push of a button. There is BBC BASIC, a word processor, a database, a terminal, a filer a diary and a calculator, all integrated and all inclusive!

The Cambridge Z88 uses just four AA batteries, and from this it will store all of your programs and files on a built-in RAM disc, so there are no cassettes to worry about or discs to lose.

The LCD display is particularly impressive, using state of the art Supertwist technology, the display is sharp at all times, and clear under even the worst lighting conditions.

The word processor is based on Acorn's View package; View is the most popular word processor available for the BBC Micro, and files and programs written on the Z88 can be transferred to and from the BBC Micro with consummate ease.

The Pipedream word processor is possible the single most powerful package written for a portable yet! Being an integrated Spreadsheet and word processor you can combine text and numbers to create stunning reports, timetables or simply letters in a variety of column widths (up to 80 column) and numeric data can be freely sorted searched and calculated INSIDE a text file - a feature only previously available on much more expensive software packages running on large machines.

Nearly all of the 32K memory is available as the RAM Disk, although additional memory packs of 128K are also available, just plug them into the machine (no soldering - no screwing) and you have four times the memory you had before, all of which is available to the Word Processor.

Connecting the Z88 to the BBC Micro is easy; by plugging in the RS232 cable from the Z88 into the RS423 socket in the back of the BBC Micro, a data exchange as fast as 19200 baud is achieved, making the Z88 a fast machine for data transfer.

Custom software is available for the BBC Micro enabling automatic transfer of files to and from the Z88 with automatic conversion and full error checking. The connecting lead plugs straight into the back of the BBC Micro and into the side of the Z88 to form a reliable data link faster than some disc drives!

The Z88 is rugged, reliable, lightweight and compact. It is considerably lighter than all other portable computers currently available, and because it doesn't need disc drives, it is more reliable than any PC "laptop" portables making it especially useful to the BBC Micro owner away from work or home.

Here's what A&B Computing had to say about the Z88:

"The Z88 is an especially worthy machine to have on the move because the files it creates in Pipedream are directly compatible with View Professional... you can write a full report using all of the facilities of Pipedream, port it across using the BBC link software and load it into View Professional."

"The Z88 is surprisingly easy to connect to the outside world - it simply has oodles of RAM disc (up to three megabytes) which can be plugged into the machine."

Need we say more? The Cambridge Z88 - a very special computer. Our Managing Director likes it so much that, he uses it!

Price: **£250 (carr £4)**

FREE

As an introductory offer, we are giving 4 Rechargeable Batteries absolutely FREE with every Z88 Micro, purchased from us this month.

ACCESSORIES

Mains Adaptor	£8.65
32K RAM Pack or EPROM Pack	£17.35
128K RAM Pack or EPROM Pack	£43.40
Z88 BBC Link	£21.70
Z88 PC Link	£21.70
Z88 EPROM ERASER	£34.75
Serial Printer Cable	£8.65
Parallel Printer Cable	£24.00
Z88 Modem	£86.90

Continued



We stock a range of monitors to suit all needs. Choice of a monitor is a matter of personal taste so we recommend that whenever possible, you ask for a demonstration at our shop. All Monitors are supplied complete with BBC connecting leads FREE.

MICROVITEC 14"

- 1431 - Medium resolution as used on the BBC television computer programme £175
- 1451 - High resolution, suitable for word processing in mode 0 £225
- 1441 - High res, exceeds the capabilities of the BBC micro £359
- 1431AP RGB + PAL and AUDIO £199
- 1451AP RGB + PAL and AUDIO £255
- 2030 CS 20" Med Res £380
- 204 CS 20" Hi Res £675
- Dust Cover for Microvitecs £5.50
- Touchtec 501 Touch Screen £239

SPECIAL OFFER

This month, we are giving away absolutely FREE, our 14" Swivel Base unit worth £16, with every 14" Microvitec Monitor purchased from us.

KAGA-TAXAN 12"

- TAXAN Super Vision 2 Type 620 Hi-res RGB Colour monitor. Ideal for Wordprocessing £269
- TAXAN Super 3, Type 625 Ultra Hi-res, RGB Colour Text mode switch allows monochrome text display in Green, Amber, White reverse or White on Blue £319

Philips BM7542 12" Paper White Monitor £75

STAR BUY

- PHILIPS 14" Hi-Res, dark glass, attractively finished Colour Monitor supplied complete with RGB, SKART and Audio/Phono connectors. A push-button switch toggles between Hi-Res monochrome green text mode and full colour display

ONLY £199

ZENITH

"Test Bureau Recommended for use in Education"

12" high resolution monochrome monitor. Ideal for word processing as its green or amber screen is very restful to read. (These are the same professional quality, stylishly finished monitors as used in the larger Zenith PC Systems.)

Green (New Design) Hi-res £69
Amber (New Design) Hi-res £74

LEADS

BNC Lead for Zenith or Philips £3
Skart Monitor Lead £5
RGB lead for KAGA £3
N.B. carriage on Monitors £7 (securicor)

SWIVEL BASES

for Video Monitors

By placing your monitor on one of our superb swivel bases, you gain the freedom to adjust the monitor viewing angle to suit your needs. By doing this, you alleviate eye strain and reduce back stress. Our professional type swivel bases have front adjustable control. This alleviates the need to lift the monitor when adjusting the viewing angle.

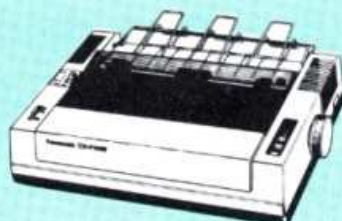
for 12" Monitors £10 (carr. £2.50)
for 14" Monitors £14 (carr. £2.50)

Anti-Glare VDU Screen

These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for all wordprocessor users. Hundreds of these screens are in daily use in various branches of one of the leading High Street banks.

£12

Panasonic KX-P1081



Available NOW at a superbly realistic price, the KX-P1081 perfectly balances features, quality of construction and Value for Money to produce the printer of tomorrow, here today, ready to sweep the current generation of machines away.

Ingenious innovation in terms of software control codes permits great flexibility when it comes to defining the print style. A nippy 120 cps of clear Draft text backs up the crisp 24 cps Near Letter Quality text mode, with upto 40 superbly useful downloadable characters. A delightful range of assorted character widths is efficiently supported, with sizes ranging from a broad 5 cpi to petite 17 cpi, EVEN in NLQ mode. Some of the extensive support for serious use includes specialised functions to perform justification, centering and even left and right ranging. Proportional spacing permit even greater freedom when it comes to advanced use. Not only is the full Epson RX compatible control code set implemented, but extra codes have also been added to cater for the NLQ options, etc.

A full 96 ASCII character set is supported, with an extended set of 32 international characters and IBM special characters as well as IBM block graphics characters. A 1K Print Buffer alleviates much of the wait time normally associated with printing, whilst the bi-directional logic seeking print head takes the quickest route to print as required.

(Price includes, FREE a 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every printer purchased from us).

Special Price: £149 (carr. £6)

Panasonic KX-P1082

To complement the hugely popular Panasonic KX-P1081, Watford Electronics are proud to announce the launch of Panasonic KX-P1082. This superb letter quality printer has all the features of the KX-P1081, plus a draft speed of 160 cps, making it ideal for high throughput users. This is a similar speed to the Epson LX800, but has an adjustable tractor feed built in and all the incredible facilities of the KX-P1081, such as variable sized NLQ between 5 and 17 cpi. KX-P1082 represents truly outstanding value at only £175, way below the price of its nearest competition. The price includes a FREE Cable & Dump Out 3 ROM.

Introductory Offer: £175 (carr. £7)

Panasonic KX-P3131 Daisy-Wheel Printer

This low-cost high-performance Daisy Wheel printer is ideal for anyone wishing to produce clear, immaculate letters or reports. It delivers, flawless text at 10, 12 & 15 CPS. Supports proportional spacing. Is Bi-directional, logic seeking. Printing speed: 17CPS. Has 6k printer Buffer. A printer of similar spec could cost a lot more than our ridiculously low price of:

Only £239 (carr. £7)

FREE 32K extra Printer Buffer with every KX-P3131 purchased from us this month.

VARIOUS PRINTERS & ACCESSORIES

- Brother HR15 RS232 Daisy Wheel £275
 - Brother HR20 Daisy Wheel £349
 - Epson EX800 Printer £399
 - Epson EX1000 Printer £545
 - Epson FX800 Printer £295
 - Epson FX1000 Printer £405
 - Epson LQ800 Printer £358
 - Epson LQ1000 Printer £529
 - Epson LQ2500 Printer £790
 - Epson LX800 Printer £180
 - Epson SQ2500 Printer £899
 - Epson Paper Roll Holder £17
 - EX800/1000 Colour Option £55
 - EX800/1000 Colour Ribbon £18
 - EX800 Cut Sheet Feeder £130
 - EX1000 Cut Sheet Feeder £195
 - FX/LQ/LX800 Single Sheet Feeder £135
 - FX/LQ1000 Single Sheet Feeder £169
 - Hi-80 Refills - Set of 4 Pens £7
 - LX800 Cut Sheet Feeder £75
 - LQ800 Tractor Feed £44
 - LQ1000 Tractor Feed £50
 - LQ2500 Cut Sheet Feeder £195
 - LX1000 Cut Sheet Feeder £305
 - Hitachi 672 Colour Plotter £495
- (Securicor Carriage on Printers £7)

EPSON PRINTER INTERFACES

All these interfaces fit inside the printer.

RS232	£27	RS232 + 2K Buffer	£55
IEEE 488	£65	RS232 + 8K Buffer	£75

KAGA/TAXAN PRINTERS

(IBM/Epson compatibles)

Kaga KP815 Printer	£269 (carr £7)
Kaga KP915 Printer	£350 (carr £7)
RS232 Interface	£49
RS232 Interface with 2K Buffer	£69
RS232 Interface with 16K Buffer	£89



CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

PRINTER SHARERS

(Ideal for School environment)

Connects	Serial	Centronics
2 BBC Micros to 1 Printer	£25	£27
3 BBC Micros to 1 Printer	£36	£35
6 BBC Micros to 1 Printer	-	£99

PRINTER CHANGER

3 Printers to 1 Micro (Centronics) £65
(Cables extra, specify type required when ordering)

Professional Printer Stand



This new professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed

and re-fold compartments i.e. one above the other, the desk space required for your printer functions is effectively halved. Additional facilities include: Easy access to paper from both sides, used with both top and bottom feed paper and with its dial controlled paper feed system with adjustable deflector plates it ensures smooth paper flow and automatic refolding.

£26 (carr. £2.50)

THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, PW1080A or any other Epson FX80 compatible Printers like Panasonic KX-P1080/1, etc., with the BBC Micro, both from BASIC and Wordwise.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

£5.95 (No VAT)

PRINTER LEADS

Centronics lead to connect BBC micro to EPSON, KAGA, SEIKOSHA, NEC, STAR, JUKI, BROTHER, SHINWA, Panasonic etc. printers.

Standard length (4 feet long)	£6
Extra long (6 feet long)	£8
Compact's Special Centronics Lead	£9
RS232 Cable	P.O.A.
IBM Parallel 1 metre Cable	£9

PRINTER RIBBONS & VARIOUS DUST COVERS

Type	Ribbons	Dust Covers
BBC Micro	–	£3.50
BBC Master	–	£4.00
Brother HR15/20	£3.00	£5.00
EX/LQ800	£7.50	£4.50
EX/LQ1000	£8.00	£5.00
FX80/85/800/MX80	£4.00	£4.95
FX100/1000	£7.00	–
Kaga/Texan KP810/815	£5.25	£4.00
LQ2500	£9.00	£5.50
LX80/86/800	£4.00	£4.50
M1009/GLP	£4.00	£3.75
Panasonic KX1080/81	£4.50	£4.75
SQ2500	£25.00	£5.50
Star NL10	£4.00	£4.50
Microvitec Metal	–	£5.50

Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

Listing Paper (Perforated)

1,000 Sheets 9½" x 11" Fanfold Paper	£7
2,000 Sheets 9½" x 11" Fanfold Paper	£12
1,000 Sheets 15" x 11" Fanfold Paper	£9
1000 Sheets true A4 Fanfold Paper	£11
2000 Sheets true A4 Fanfold Paper	£20
Teletypewriter Roll (Econo paper)	£4

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50. 2K Sheets £3.00

PRINTER LABELS

(On continuous fanfold backing sheet)

1,000 90 x 36mm (Single Row)	£5.00
1,000 90 x 36mm (Twin Row)	£4.90
1,000 90 x 49mm (Twin Row)	£7.50
1,000 102 x 36mm (Twin Row)	£6.25

Carriage on 1,000 Labels £1.00

MEGABUFFER 256



This new Megabuffer 256 from Watford is a full featured 256K Printer Buffer. It allows the computer to print 256,000 character in a short time thus freeing the computer very quickly. In short it makes light work of printing large documents, screen dumps, etc. It is extremely simple to connect. The features are:

- Low Cost, High performance.
- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatibility with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in test unit for both the buffer & your printer.

In conclusion it can safely be said that MEGABUFFER 256 is the ultimate printer Buffer for both the amateur and professional user.

Only £125 (carr £2)

OFFICE MASTER



CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trail balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only £21 (Disc)

OFFICE MATE



- DATABASE
- BEEBCALC SPREADSHEET
- BEEBLOT GRAPHICS

DATABASE – Set up a computerised card index system with powerful search facilities.

SPREADSHEET – Offers many calculation and editing features.

BEEBLOT – Provides visual representation from Spreadsheet data.

OFFICE MATE Only £10 (Disc)

All prices in this advert are exclusive of VAT.

NEW LAUNCH OFFERS Type DP35-800S



A Double disc drive – with a difference! Times are changing fast for the floppy disk, and whilst the current standard for the BBC B and Master Series is the 5.25 inch disk, the standard for the future will most certainly be the smaller, faster and more reliable 3.5 inch disks – now a standard feature of both the Master Compact and the Archimedes Series.

To support the present disc drive users, and cope with the future, we have designed our own plinth-mounted disk system – called the DP35 800S, it contains both the 5.25 inch and the 3.5 inch drive formats as well as offer a firm and rigid support for a monitor on top. With the BBC Micro underneath, the plinth makes a surprisingly small footprint on the desk – leaving you more space to work with.

The 5.25 inch disk drive is 40/80 track switchable, and has its very own power supply running independently of the BBC Micro.

Watford's new plinth enables users to read, write and format disks both in DFS and ADFS format – currently the accepted standard for the Master Compact and the Archimedes, it also enables the user to read disks written for the Archimedes.

Launch Offer: £165 carr. £7)

CSPM 400/S DISC DRIVE

A single (1 Megabyte unformatted), double sided, 40/80 track switchable 5¼" disc drive mounted in a BBC Master Plinth (same as DP35-800S) but with a blanking plate to add a second disc drive at a later date. The in-built Power Supply is capable of running two disc drives. The unit is supplied complete with cables and a utilities disc.

Launch Offer: £139 (carr. £7)

30 Megabyte Winchester Drive



Undoubtedly the best value for money Winchester Hard disc available anywhere for the BBC Micro.

This 30 Megabyte hard disc is completely compatible with the Acorn ADFS – that's why we have bundled it with each Winchester drive, along with a full user guide and full utilities including file copy, 1000K save routines, Format and Verify – in fact all you need and more.

Finished in rugged metal and fetching BBC beige, the Winchester has an internal fan, so quiet you won't even hear it! A switched mode power supply and a neon-lit on/off switch are there along with a light on the hard disc to tell you when it is working – just compare the price with our competitors' 20 or 28 Mbyte discs!

Compatible with the Master, and the BBC B (with 17" X disc interface).

Launch Offer £449 (Carr. £12)

Phillips 12" PAPER WHITE Monitor Type BM7542

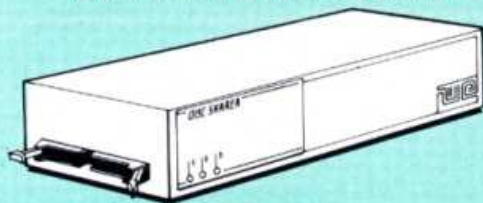


This attractively finished high resolution monitor, has an anti-glare screen and a tilt stand for optimum viewing angle. Its 1000 x 850 pixels resolution coupled with high contrast makes it ideal for both word processing and graphics. The paper white display is especially suitable for desktop publishing and CAD packages. It also has a Video/Audio input.

Only: £75 (carr. £7)

NEW

DISC DRIVE SHARER



(Ideal for educational establishments)

At last, a low cost alternative to the Econet system. Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not compatible with ADFS.)

Launch Price: £59

Price includes 3 Cables

NOW WITH EXTRA FEATURES
AT NO EXTRA COST – Watford's latest DFS 1.44

- Incorporates Acorn's Official Tube Host Code so that those with 2nd processors no longer need to waste a ROM socket on the DNFS.
- Option to DOUBLE the speed of BPUT and BGET.

If you already have the Watford Electronics DFS and wish to incorporate these new facilities then simply return your existing DFS ROM to us together with £5 remittance for an upgrade. Please pack the ROM securely and address the package to our Upgrades Dept.

WATFORD's & ACORN's
SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for five years and has gained a large following amongst serious and educational users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade. (P.S. Watford's highly sophisticated DFS is fully compatible with Acorn DFS). (not Acorn's 1770 DFS)

- Complete Disc Interface Kit including DFS ROM and fitting instructions £46
- Acorn's 0.90 DFS Kit complete £45
- DFS Manual (Comprehensive) (no VAT) £6.95
- (P.S. Our comprehensive DFS Manual covers both Acorn & Watford DFSs).
- Watford's sophisticated DFS ROM only £16
- We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only £12
- DNFS ROM only £17 ● ADFS ROM only £25
- Watford's DFS is exclusively available from Watford Electronics and their appointed dealers only. Every ROM carries a special label with LOGO and serial number.

NEW WATFORD's Mk II Double Density
DFS INTERFACE

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our MkII DDFS board has been adapted to allow the use of Acorn ADFS.

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk – Ours allows both of these!

If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only £30.00.

- Special introductory offer £39.00
- DDFS Manual (No VAT) £6.95
- We will exchange your existing DFS Kit for our sophisticated DDFS for only £25.00

Please note, as the MkII DDFS is a hardware and software upgrade, it is not possible for existing Watford DDFS users to simply exchange their ROM for the new version.

SPECIAL DISC DRIVE/DDFS OFFER

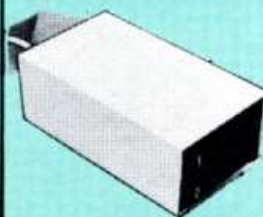
Type CLS400



- The popular Mitsubishi 400k Single Disc Drive, Double Sided, cased with Cables. Plugs directly to your Micro.
- Watford's popular DDFS Disc Interface (allows 720k storage). Will run in both Single and Double Density modes 40/80 track Software switchable.
- A comprehensive User Friendly Manual.

A Bargain at Only £130 (£6 carr)
(Offer valid while stocks last)

3 1/2" DISC DRIVE OFFER



These top quality 3 1/2" Double sided, 80 track, 1 Megabyte (unformatted each Disc Drives), are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc. They run directly from the BBC B/Master's own PSU.

- Single 400K Drive £69
- Twin 800K Drives £126

MYSTERIES OF DISC DRIVES
& DFS REVEALED (BOOK)

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

Then The Mysteries of Disc Drives and DFS Revealed is the book for you. It explains in detail the different types of systems available, how they are installed and how to use them. Many examples are given including pre-written programs to call various functions of the DFS available only through Operating System calls. Different types of disc, 40/80 tracks etc. are all explained. This book is ideal for the beginner confused by the plethora of choice available in the marketplace.

£5.95 (Book No VAT)

DISC ALBUMS

Attractively finished in antique brown leather look vinyl. Stores up to 20 Discs. Each disc can be seen through the clear view pocket.

£4

FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use. Available in 3 1/2" & 5 1/4", please specify.

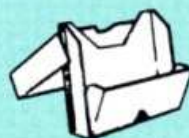
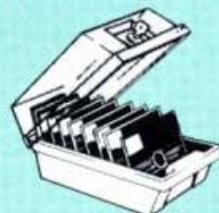
£7

ANTISTATIC LOCKABLE DISC STORAGE UNITS

Gives double protection – Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption whilst in storage. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

- M35 – holds up to 50 5 1/4" discs £6.00
- M85 – holds up to 95 5 1/4" discs £8.00
- M25* – holds up to 25 3 1/2" Discs £5.50
- M50 – holds 50 3 1/2" Discs £7.50

* Not lockable

PLASTIC
LIBRARY CASES

Holds up to 10 5 1/4" Discs. Only £2.00

DISC PLONKER RACK

When using ones micro, there is a tendency to have more than one Disc on the desk. This exposes them to the hazards of fingerprints, scratches, dust, coffee and an untidy desk.

Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. It holds up to eight 5 1/4" Discs.

Protection at Only: £2



DUST COVERS (For our Disc Drives)

- Single CLS (without PSU) £3.20
- Twin CLD (without PSU) £3.85
- Single CS (with PSU) £3.95
- Twin CD (with PSU) £3.90

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates capacity in single density mode. That within the brackets is the capacity in double density mode. All disc drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our 80 track drives are already fitted with a 40-80 select switch.

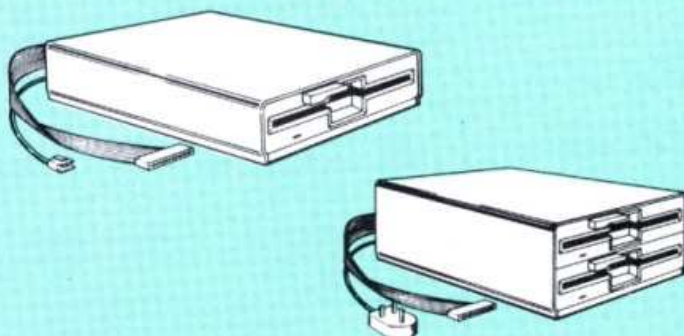
All our Disc Drives are Double Sided and will operate in both Single and Double Density modes. Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.

Various other "manufacturers" of disc drives for the BBC micro (more accurately, "packages" label other manufacturers drives with their own name). We buy the high quality JVC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. Ideal for Schools & Colleges. We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below are for single drives in standard single cases. Single drives in a dual case cost an extra £5. (At Watford we anticipate your needs of tomorrow, not just today!)

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space! your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with Watford plinth. (Turn to the 6th page of our advert for the Plinths). P.S. All our 5 1/4" Disc Drives with PSU are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.



Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
200K (360K)	CLS 200 £89		CS 200 £98	
400K (720K)	CLS400S £89	CLD 400 £168	CS 400S £99	CD400 £188
800K (1.44M)		CLD 800S £169		CD 800S £188

● TWIN Disc Drive Case, complete with Power Supply & Cables £43
Securicor carriage on Disc Drives £5 to £6

Prefix C = Cased Drive
L = Less PSU
S = Single
D = Double

Suffix S = 40-80 Switchable

e.g. CLS400S = Cased Disc Drive, Less power supply unit, single 5 1/4" 400K, (720K in double density); Double sided; 40/80 track switchable.

Cable to connect 5 1/4" Disc Drives to BBC Compact
Single £9 Twin £12
Special Cable to connect both 3 1/2" and 5 1/4" Disc Drives
simultaneously to the BBC Compact £13

3M - DISKETTES

3M - SCOTCH Diskettes with Lifetime warranty from Watford Electronics your 3M Appointed Distributor.

● 10 x 5 1/4" S/S D/D 40 Track Diskettes	£8.25
● 10 x 5 1/4" D/S D/D 40 Track Diskettes	£10.20
● 10 x 5 1/4" S/S D/D 80 Track Diskettes	£12.75
● 10 x 5 1/4" D/S D/D 80 Track Diskettes	£13
● 10 x 5 1/4" 1.6M D/S D/D High Density Discs for IBM XT and AT	£28
● 10 x 3 1/2" S/S D/D 40/80 track Discs	£15
● 10 x 3 1/2" D/S D/D 40/80 track Discs	£19.50

TOP QUALITY 3 1/2" & 5 1/4" DISKETTES

To complement the range of quality discs and disc drives that WE already sell, WE are now supplying some special offer packs of 10 high quality discs. Each Disc has a reinforced hub ring and carries a lifetime guarantee. These are supplied complete with selfstick labels and packaged in an attractive plastic library disc box to protect them from damage. We strongly recommend these Discs.

DON'T SETTLE FOR LESS, BUY THE BEST

● 10 x M3 3 1/2" D/S D/D 80 Track Discs	£18
● 10 x M4 5 1/4" S/S D/D 40 Track Discs	£6.50
● 10 x M5 5 1/4" D/S D/D 40 Track Discs	£8
● 10 x M7 5 1/4" D/S D/D 80 Track Discs	£9
● 3" Double Sided Discs	£3 each

Special BULK OFFER on 5 1/4" DISCS

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)

BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
● Without Sleeves	£35	£39	£45
● With Sleeves	£38	£42	£48

ACORN WINCHESTER DRIVES

FILESTORE E01	£825
FILESTORE E20	£705
Acorn 30MB Unit incl. Level III Software	£1520

WATFORD's WINCHESTER DRIVES

● 10 Megabyte Unit with ADFS	£399
● 30 Megabyte Unit with ADFS	£449
● 40 Megabyte Unit with ADFS	£749

CDP800S

CDPM800S



Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The switches are mounted on the front panel for ease of use.

CDP 800S for BBC Micro £192
CDPM 800S for Master £196

(Securicor Carr. £7)

(The above drive units are 2 Megabytes unformatted)

ACORN'S Twin 800K Disc Drives

Specially mounted side by side in a Master Plinth. Supplied complete with Cables. Plugs directly to the Master Computer.

RRP £250

Our Price: Only £182

(carr £7)



Continued →

NOMINATED
FOR



1987



QUEST MOUSE

The ultimate in Mouse technology, the Watford Electronics Quest Mouse must be the most powerful Mouse package yet produced for the BBC Micro. Featuring state of the art 32K ROM software the Quest Mouse package is filled with features essential to the budding artist. The Quest Mouse is a high precision, low profile and large footprint mouse. It has three large comfortable buttons and is smooth and easy to use on most work surfaces. The Quest Mouse is FULLY HARDWARE COMPATIBLE with the AMX MOUSE so that it will work with any of the AMX range of software.

The two parts of the Quest package are available separately so that existing Mouse owners can upgrade to the Watford's sophisticated Quest Paint software or replace their existing worn out mice for a minimum cost.

QUEST PAINT

The Quest Mouse software is supplied on a PALPROM unit to allow the sophisticated 32K program to be used from a single ROM socket. It is compatible with the BBC B, BBC B Plus and BBC Master Series machines.

The software is used to draw high resolution Mode 1 pictures in full colour. All menu selection and control of the drawing process is performed with the mouse so that you will hardly ever touch the keyboard.

SOFTWARE FEATURES

The software is far too powerful for us to describe it fully in such a small space. Below is a list of the various features. Please write to us for a fully descriptive leaflet.

Disk interface not required. Utilities disk has facility to create and print big screens. Colours applied can be solid, either pattern of user defined pattern. Drawing can use brush or airbrush. Brush shapes can be defined and stored. Airbrush sprays colour/pattern randomly with four jet sizes and even or center spread. Colour cycles. Colour protection to stop particular colours from being overwritten by selected drawing actions. All standard drawing facilities like: rubber, straight pencil lines, triangles, circles, ellipses, rectangles, parallelograms, polygons, etc are provided. All shapes can be solid or just a boundary line. Once a shape has been set up it can be repeated anywhere on the screen. Global colour replace in a rectangle. Powerful fill facility for areas and vertical/horizontal lines. Full cut and paste of rectangular areas with rotation and size with screens from Watford Beeb Video digitiser. Load and Save screens with colour pallet information, save brush and pattern definitions etc.

Take The Guesswork Out of Selecting a Mouse Package

With reviews like this how can you go wrong.

Popular Computing Weekly, 9-11 June '87

"What you actually get for your money is a well built, three button mouse (far superior to the AMX mouse)."

"Overall the combination of a quality mouse and decent art package gives Watford Electronics a real chance of supplanting AMX as mouse supremos."

Micro User June '87

"Quest Mouse and Quest Paint can hold their heads high in the market. . ."

A&B Computing June '87

"... Watford Electronics, a company famed for excellent hardware add ons and versatile software packages. Called Quest mouse, 'this is a very special mouse driven drawing package. . ."

"... you will have one of the most comfortable and professionally built mice I have used in a long time. The buttons are responsive, the mouse movement is smooth and without directional bias - a pleasure to use."

"What we have here is probably the best art package there is for the BBC Micro. . ."

"Quest Paint is a major leap forward in BBC programming. . ."

"Quest Paint is an original piece of programming, it is friendly and well endowed with many useful facilities. I would comfortably say it is easier to draw good pictures with Quest Paint than it is with more expensive 'Professional' art packages for the Atari ST and the Commodore Amiga. A recommended buy if you are looking for the best in BBC micro based art packages".

Acorn User, September '87

"The mouse (Quest) performs well in the face of competition from AMX, Wigmore and the rest. . ."

"... this package represents excellent value for money. If you are interested in art then this program is for you to buy."

"Given time, I can see no reason why Quest Paint shouldn't take on the title of the definitive art package available for the BBC Micro to date".

"All in all, Quest Paint is a very professional package. It contains virtually every feature the budding artist could require".

"What makes Quest Paint so versatile is the addition of a sub-menu which allows you extensive control over each function".

"Until recently, Superart from AMS had been judged as the definitive mode 1 graphics package for the BBC micro. But now it has a serious rival in the form of Quest Paint, from Watford".

"As a measure of what is contained within Quest Paint, I would say it had all the features of Superart plus. . ."

"In most art packages, provision is given for drawing triangles and rectangles. Quest Mouse goes 14 better, allowing any regular polygon of upto 16 sides".

"One facility, not found on any other Art package to my knowledge, is the ability to access a digitiser from within the program". The reviewer concludes by saying, "The result is an extremely comprehensive and professional art package".

John Kilby, Head of Computer Science, Bishop Wulstan High School, Rugby, writes:

"Quest has been an excellent piece of equipment. The problem that seems to occur everyday is that at lunchtime the pupils rush to the computer room to make sure that they are first in the queue for the 'Quest' mouse".

Lt. Cln. C.G. Holton, G2 HQ 1 (BR) Corps, BFPO 39, writes:

"As ever your service is superb and the Quest Mouse proves every bit as good as the adverts claim".

Beeblet User Group, New Zealand Oct '87:

"One of its nicer features is that the top menu is done in Mode 0, the drawing itself is in Mode 1. Thus on screen together are two different Modes. A neat way around an old problem".

"PAN is used when a larger than one screen size image is required. The mind boggles at an A3 size drawing".

"I like it partly because of the mouse itself which is smooth and easy to handle but mainly I suppose because of the features I longed for and previously never got. Its easy to use with almost everything at your fingertips from the mouse. The software is simple where needed and complex where complexity is required".

ConQuest

Watford's Quest package is an extremely powerful and flexible drawing package, with very wide and unusual features. However, since its launch various suggestions for even more advanced & powerful facilities were received from the Quest users. ConQuest allows you these more advanced facilities, like, distortion of a cutout to any shape and a full font designer. If you also have a GXR ROM in your machine or you are using a BBC Master then ConQuest will take advantage of this to give ellipses at any angle, sectors and arcs, etc. Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.

Some of the features are:

- Pick filenames off the screen for loading and saving.
- Rotate a cutout to any angle and Distort it to any four sided shape.
- Has Built in Font editor.
- Default brushes and patterns on startup.
- 16 x 16 font available on start up.
- Ability to reset patterns, fonts and brushes to default at any time.
- ROM based enhanced Epson and compatible printer dump.
- ROM based enhanced extended picture routine.
- Ability to create and abort extended pictures.
- Improved disk access speed for extended pictures.
- User definable sideways RAM driver for incompatible sideways RAM systems.
- Ellipses at any angle on Master 128 (or B with GXR ROM).

QUEST MOUSE & QUEST PAINT £59

QUEST MOUSE, QUEST PAINT, AMX PAGEMAKER & PAGEFONT £85

QUEST MOUSE ONLY £29

QUEST PAINT SOFTWARE £32

QUEST FONT DISC £12

ConQuest 32K ROM Package £29

QUEST MAT £3

Part-exchange your old Mouse for a New QUEST MOUSE for only £23

N.B.

1. Quest Paint supplied complete with Software in a 32K ROM, Comprehensive User Guide and a Utility Disc.

2. Quest Font Disc has 22 text FONTS for use within Quest Mouse.

MARK II LIGHT PEN

Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted.

Price Only £19

(Price includes software on Disc)

RB2 Marconi Tracker Ball

RB2 (AMX/Quest compatible) £59

RB2 including Quest Paint £85

FLEET STREET EDITOR

Software pack for BBC Micro £31

Software pack for the Master £39

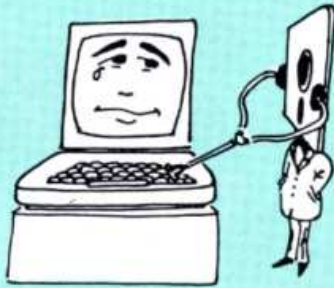
Software Pack for Compact £40

Admin Xtra Disc Utility £13

Walt Disney Disc Utility £13

Fonts N Graphics Disc Utility £13

DIAGNOSTICS DISC



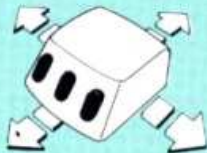
The BBC Micro is a very complex machine and thus diagnosing a fault can be very difficult. At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.

The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb: RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.

This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

THE AMX MOUSE



ONLY: £59 Inc. Super Art package
(carr £1.50)
(Please specify for BBC, Master or Compact)

FREE our popular Colour Art software pack worth £15 with every AMX Mouse package purchased from us.

AMX MAT	£3
AMX MOUSE ONLY	£29
AMX DESK Package	£19
AMX UTILITY Package	£11
AMX SUPERART Package	£39
AMX STOP PRESS - A Desktop publishing software. Works with Keyboard, Joystick or a mouse	£32

We are giving away absolutely FREE, our PAGE-FONT disc with every purchase of STOP PRESS from us.

PAGE-FONTS - Over 20 Fonts for use with AMX Pagemaker **£9.50**

AMX DESIGN (ROM)	£59
AMX 3D ZICON Disc	£19
AMX Database Disc	£19
AMX XAM Educational	£15
AMX MAX A gem of desktop (ROM)	£15

TED

THE ULTIMATE TELETXT SYSTEM

TED is one of a new generation of powerful 32K ROMs for the BBC B, B+ and Master computers and is compatible with disc, tape and network systems. It is in everyday use in schools, colleges and universities. Programmers, Prestel I.P.'s, Micronetters and exhibitors have also found it indispensable.

TED includes the most comprehensive teletext (Mode 7) screen editor ever written for the BBC micro, combining flexibility with ease of use. Its sophisticated facilities include line, column and block copying within AND between frames; text, in a variety of styles and sizes, entered directly from the keyboard; graphics and line drawing modes; search and replace; margins; printer dump routines and a library of in-built icons and typefaces. TED will edit ANY mode 7 screen and can even convert high-res graphics screens to mode 7! Included within the ROM is a fully Epson compatible mode 7 graphics dump routine giving a grey scale printout of exactly what appears on the screen.

Using 'SHOW' (a versatile carousel), collections of mode 7 screens may be 'routed' or displayed sequentially, making it ideal for creating and running 'Viewdata' information systems. Over 1200 frames may be stored on a twin 80 track drive. A unique feature of TED is 'SCROLL', which lets you create pages of up to 600 lines which may be viewed 'Wordwise style', automatically or manually. SHOWs and SCROLLs may be freely mixed and even used from within a BASIC program.

The package comprises a 32K ROM, a 117 page manual, a function-key strip and a demonstration disc containing examples of real-time animation and a sample 55-frame database. A stand-alone machine code routine is provided allowing SHOWs and SCROLLs to be displayed on machines not fitted with TED.

Price: £35

ROM-SPELL

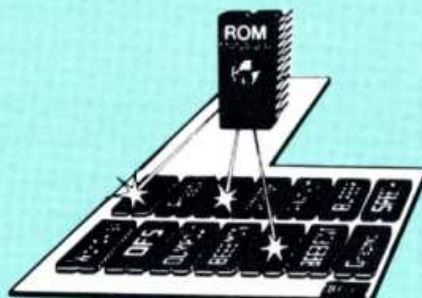


Probably the most advanced and fastest spelling checker available for the BBC Micro. Compatible with View, Wordwise and Wordwise Plus ROMSPELL is simple to use with easy editing of incorrect words. Full facilities for editing the user dictionary to allow customisation to your personal needs. Dictionary includes over 30,000 words and is supplied with a Comprehensive manual.

NOT compatible with 1770 DFS.
(Please state 40 or 80 track disc)

Price still only: £25

ROM MANAGER

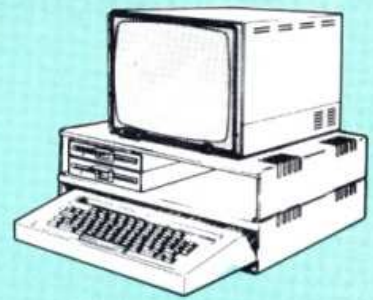


Take control of your Sideways ROMs with ROM Manager. This powerful utility ROM gives you power over your sideways ROMs. Disable whole ROMs, send commands directly to named ROMs and many other powerful facilities.

"Provides comprehensive management of all your installed ROMs". (BEEBUG November '84.)

ONLY £20

PLINTHS FOR BBC MICRO, MASTER & PRINTERS



Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or side-by-side dual disc drives or TORCH Disc pack, to be placed in the centre section. If you use our stacked drives, the remaining space can be used for further peripherals e.g. Speech Synthesizer, EPROM programmer or simply stationery. The computer slides neatly in to the lower section allowing easy access to remove the lid. The printer plinth is equally sturdy but without the cooling slots. It allows for access to the paper from the front as well as from the rear, (a facility not often thought of in similar products) if the paper is located beneath the plinth. This is a very convenient way to work especially if your work area is not deep enough to take the printer and paper separately.

SINGLE BBC PLINTH	£11 (carr. £1.50)
DOUBLE BBC PLINTH	£19 (carr. £3.00)
PRINTER PLINTH	£10 (carr. £1.50)
SINGLE MASTER PLINTH	£14 (carr. £1.50)
DOUBLE MASTER PLINTH	£24 (carr. £3.00)

COPY HOLDERS



How often have you been about to type handwritten notes into your computer when you find that there's nowhere to rest the paper or that your notes are resting at the wrong angle to read the type? Whether the notes be your latest program or the draft of a new trilogy, the new Manuscript Holders from Watford are superb for holding your paper at the ideal height and angle to allow you read and type in ease and comfort.

Available in 2 versions, desk resting and shelf clamping versions, these two units hold your paper firmly by means of a plastic retaining ruler and a clip grip. Both units are full A4 size.

Amazing value at only
Desk Top **£10** (carr. £2)

Angle poise **£14** (carr. £3)

Continued →



ARIES CORNER

The Aries B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the 6502 processor socket on your BBC micro - no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

Price: **£80** (carr. £2)



**CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383**

Aries B-12 Sideways ROM Board

This board is extremely well made, simple to install, reliable when fully loaded and compatible with the Aries-B20 and the Aries-B32.

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

The B12 system consists of two parts: a large detachable "mother board" which carries the extension ROM sockets and a small "base board" on a short ribbon cable, which plugs into the existing sideways ROM sockets. This two-board design eliminates the reliability problems previously associated with some other ribbon-cable based systems.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost.

Price: Aries B-12 **£40**
Aries B-12C **£5**

ARIES B-488 IEEE-488 INTERFACE UNIT

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

£238 (Carr £3)

SIDEWAYS ZIF SOCKET



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.

- The low profile of the socket allows unrestricted access to the Keyboard.

- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.

- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)

- BBC, B+ and Master compatible.

ONLY £15 (carr £2)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack.

- Complete System **£11**
- Spare Cartridges **£2.50**
- Spare Rack **£1.50**

16K Sideways RAM Modules

Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.

Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
- May be fitted in systems even with a ROM board.
- Multiple units may be fitted, even with a ROM board.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

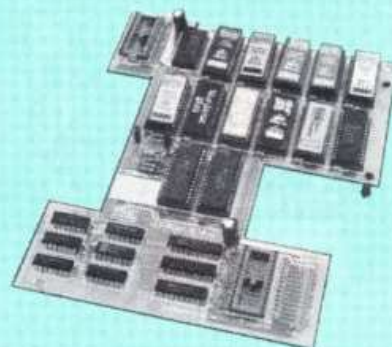
Only: **£24** (carr £2)

Optional extras

READ and WRITE protect Switches **£2** each
Battery for Battery Backup **£3**

**All prices in this advert are
exclusive of VAT.**

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others - not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16.

Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are required.)

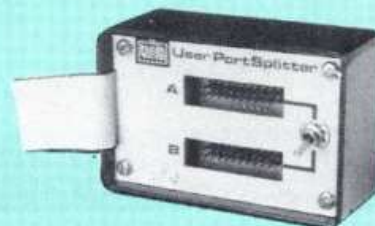
- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- No soldering required.
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish" allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: **Only £32**
Battery backup fitted **£36**
(carriage £2)

- Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

Only: **£8**

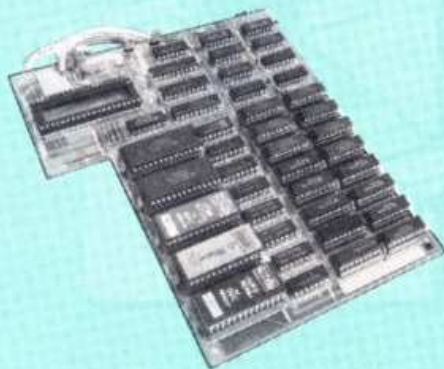
USER PORT SPLITTER UNIT



Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaneously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination.

Excellent Value at £19

ROM/RAM CARD



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with all BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Accepts any ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPILL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

Please write in for further details.

INTRODUCTORY PRICES:

- ROM/RAM card with 32k dynamic RAM£39
- ROM/RAM card with 64k dynamic RAM£52
- ROM/RAM card with a massive 128k dynamic RAM£80

(carriage on ROM-RAM Card £3)

OPTIONAL EXTRAS:

- 16k plug-in Static RAM kit£6
 - 16k Dynamic RAM for Upgrade£7.50
 - Battery backup£3
 - Read and Write protect switches£2 each
- Complete ROM-RAM board
All options installed£89

P.S.

Is your existing ROM Board overflowing with ROMs? Do you need more Sideways RAM? Is your Board unreliable? Then upgrade to Watford ROM/RAM Board and pay £10 less

Le Modem



The MODEM from Watford

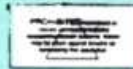
At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 & 75/1200 UK and BELL (USA) are all supported.

The features that make Le MODEM such good value are:

- A complete communications terminal that transforms your BBC Micro into a very powerful World-wide data transfer system.
- Auto Dials, Auto answers, and is completely controlled by your micro. There are no external controls!
- Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY 88 and more.
- Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER, Le MODEM does the rest.
- Supplied with a comprehensive telecomms package in a 16k sideways ROM which includes a FULL PRESTEL terminal allowing TELE-SOFTWARE to be downloaded.
- A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!
- FULLY controlled by simple **COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!
- Connects to the 1MHz bus. A *AUDIO ON-OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.
- Completely self contained with internal mains power supply. (Even a free mains plug is fitted!)
- A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.
- Packaged in such a way that you need nothing else except a BBC Micro to communicate with computers all over the world.
- FREE Registration to MicroLink.

SPECIAL OFFER

Price: **£84**
(carr £3)



(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

Nightingale Modem

SPECIAL PRICE to our Customers

£82



(Price includes: Nightingale Modem, Commstar ROM pack & Comprehensive manual)

Nightingale Modem without software Only £75
COMMSTAR ROM package only £29
(P&P on modem £3.00)

APOLLO



The NEW Modem from Watford

Following numerous requests from you, our discerning customers for an APPROVED, Low Cost & High Performance modem with Auto Dial & Auto Answer facilities (as standard) we bring you the versatile APOLLO Modem. Just compare the features and look at the price (which incidentally includes the cost of the Software, manual and BBC connecting cable). We are sure you will agree that Watford Electronics in their traditional way are giving you a super 'value for money' deal.

Just look at these features:

- V21 for Bulletin boards, Microlink, Telecom Gold, etc.
- V23 for Prestel, Home Banking, and other Viewdata services.
- Reverse V23 allows User run Viewdata service.
- 1200-1200 half duplex for communications.
- XMODEM, HEX and ASCII file transmission.
- Auto Dial of given 'phone number.
- Auto Answer for User's Bulletin Board.
- 80 column terminal with split screen facility.
- Prestel text screen dump.
- Fully BABT approved.
- FREE Registration to MicroLink.

● £6.50 off annual Membership to Micronet, Prestel and Telecom Gold.

The Apollo is attractively finished in matt black. It opens the doors to world communication to both, the Hobbyist and the Professionals alike. With baud rates varying from 300/300 Originate and Answer, 1200/75 and 75/1200 full duplex and 1200/1200 half duplex, virtually all the popular tele-services can be accessed. A comprehensive Comms ROM oversees the use of the APOLLO, providing simple commands for all the software controlled facilities. APOLLO is an ideal modem for both the first time buyer and the seasoned user. Join the Telecommunications Revolution - Buy a Watford APOLLO!

Only: **£84** (Carr £3)

Price includes, the Modem, Comm Software Cables & Operating Manual).
(Write in for full specification)

Minerva Systems Software

System Delta with Card Index	£55
System Programmers Ref. Guide	£19
System Gamma	£43
System Gamma Prog. Ref. Guide	£19
System Mailshot	£17
System Reporter	£17
System Intrier/View Link	£17
System Sales Ledger	£39
System Purchase Ledger	£39
System Nominal Ledger	£48
System Stock Management	£39
Order Processing/Invoicing	£39

Versatile BEEB SPEECH SYNTHESISER Unit



The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32 (carr £2)

Continued



COMPUTER CONCEPT'S ROMS

ACCELERATOR	£48
CARETAKER Basic Utility	£25
DISC DOCTOR	£28
Graphics ROM	£23
TERMI	£25
COMMUNICATOR	£49
SPEECH ROM	£24
Printmaster	£24

Wordwise

£24

Wordwise plus

£40

We are giving away absolutely **FREE**, the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear text-segment area.
- BBC B, B+ and Master compatible.

Only £24

(N.B. Word Aid requires a Disc Interface in your Micro)

HI-WORDWISE-PLUS DISC: £5

SPELL MASTER £45

Inter SHEET ONLY £37

CHART

ONLY: £26

Inter-WORD

Only: £39

INTERBASE £55

All Prices Exclusive of VAT

VIEW

VIEW WORDPROCESSOR 2.1 £35

VIEW 3.0 ROM £48

VIEW PROFESSIONAL £79

HI-VIEW £36
(for use with 6502 2nd Processor)

VIEW Printer Driver Generator £9
(Please specify Disc or Cassette)

VIEWSHEET (Acornsoft) £37

VIEWSTORE £37

VIEWSPELL with 80 track disc £29

VIEWPLOT Disc £22
(Please specify for Master 128 or Compact)

VIEW-INDEX £12

OVERVIEW Packs 1 & 2 for the Master £75

Watford's own Sophisticated VIEW PRINTER DRIVERS

Epson FX80 & Kaga KP (Disc) £8
Juki & Brother HR15 (Disc) £8
Silver Reed Printers (Disc) £8

Micros in Business (Disc)
An introduction to Business software for the BBC Micro from Acorn £43

ADVANCE COMPUTER PRODUCTS' ROMs

Adv. Disc Toolkit £29
Adv 1770 DFS for Mast/Compact £29
Adv 1770 DFS for BBC/BBC+ £29
Adv Disc Investigator £24
Adv. Control Panel £29
Adv. Rom Manager £13

MINI OFFICE II
Disc Version £14.50
ROM Version £48.00

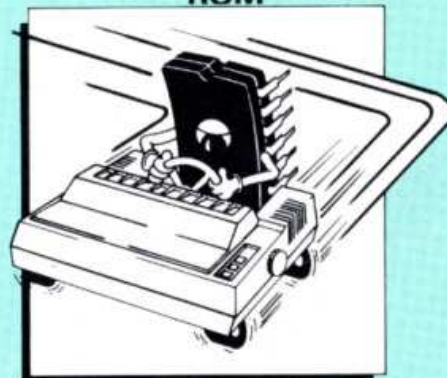
REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

£13 (40 or 80 track)

Acorn's Speech Synthesiser package, complete
Special Offer £18

VIEW PRINTER DRIVER ROM



View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing only at a small outlay.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, LX, JX80 range, Hi80, KP810/910, PW1080, JP101, HR15, M1009, GLP, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redefinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute * command when printing.

Other features include a very powerful on screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips. (Write in for a detailed leaflet).

Price: Only £33

EPSON NLQ ROM for the BBC Micro



Harness the full potential of your Epson RX or FX printer. The NLQ ROM makes Epson printers produce Near Letter Quality output with optional proportional spacing, enlarged and underlined. Accessed by simple * commands from Basic, Wordwise and View (with driver) or almost any other language.

(Send an SAE for sample printout)

Only: £25

VIEW PRINTER DRIVER for NLQ ROM £7

DUMPOUT 3



A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including full Mode 7 graphics. Also provided are window setting utilities and OSWORD calls to plot and read Mode 7 graphics pixels.

Facilities:

- Vertical and horizontal scaling in all graphics modes and mode 7
- Rotation of image by 90, 180 or 270 degrees
- Left hand margin setting
- Screen dump window setting
- Colours appear as grey scale
- Two tone fast dump
- Colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered and User Port triggered dumps

The Micro User Feb. 1985.

'Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC Micro ... it must represent excellent value for money and surely cannot be beaten'.

For use with the following printers:

GLP, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, M1009, NEC PC8023, DMP100/200/400, Panasonic KX1080, Mannesman Tally and compatibles.

Only: £25

(Write in for further details on all above ROMS)

THE EUREKA CARD

(The Unique RAM Expansion System)

The Eureka Card is Watford's latest and most sophisticated RAM expansion system. Using advanced PAL based technology this card is a breakthrough in RAM systems for the BBC micro. The Eureka Card provides the user with around 58K of free memory in Basic, VIEW and WORDWISE PLUS. You also get Shadow RAM from within the active language. No other RAM expansion system can match that!

Load up to 58K long Basic programs. Texts in VIEW and WORDWISE PLUS up to 58K as well. This with absolutely NO loss of speed in accessing your text or program. Eureka consists of a card containing 64K of program memory, two parallel banks of sideways RAM and some extremely complex switching circuitry. This is all controlled by Eureka's highly sophisticated software supplied in ROM. Designed to a very high specification, this board is fully buffered to give reliable operation under virtually any circumstances.

The Eureka board plugs into the 6502 socket and has NO messy flying leads. It is compatible with many other products from Watford, such as our Solderless ROM Board and our ROM/RAM Board. All in all, the Eureka Card is an amazing board. Jump into the age of serious data processing with a Eureka Card! Please write in for further details 'on advantages the Eureka can offer you'.

Introductory price: Only **£89** (carr £3)

(P.S. Eureka is only suitable for a standard model B; it normally replaces any Shadow RAM cards present. Some speed degradation does occur with filing system access. Eureka cannot be used at the same time as a second processor).

BEEBMON

The most powerful machine code monitor for the BBC Micro **£24**.

THE NLQ DESIGNER

(The First & still the Best)
Supplied with over 25 Different fonts

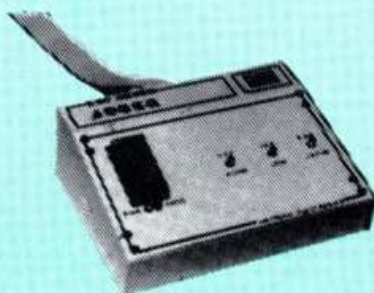
A massively useful utility for users of the Taxan/Kaga KP810/910 or the Canon PW1080. This program allows you to define NLQ character sets to download into the printer's memory. Full on screen editing of the font. Requires 6264 RAM chip to be fitted in the printer.

Supplied with disc containing over 25 example fonts. (Please specify 40 or 80 track when ordering.) Fonts are: Italic, Courier, Courier Italic, Script, Copper Plate, Shadow, Bold, Double Print and Gothic etc. (P.S. This ROM is not suitable for Epson printers.)

- NLQ Designer ROM, FONT Disc and Manual

£25

ADDER



Adder is the ultimate EPROM programmer for the BBC Micro. It will program many different EPROMs up to the very latest 27256 32K devices.

The Adder unit connects to the User Port and draws its power from there too. The EPROM is mounted in a top quality ZIF socket. There are no switches or controls as Adder is entirely software controlled.

The Adder software provides sophisticated facilities for programming EPROMs from a RAM image produced by loading disc files. The software is menu driven and designed for ease of use.

Features:

- Two ultra fast programming algorithms or standard slow algorithm.
- Supports standard 21V programming and newer 12.5 volt EPROMs. (Software switched).
- The RAM image to be programmed can be built up in many ways. Sections of image can be loaded separately. Part programming. Read EPROM. Edit data in memory.
- Automatic processing to handle a list of files to program into the EPROM.
- Automatic disc buffering to allow programming of 32K 27256 devices from a 32K file without extra effort.
- Verification gives detailed error list and checksums are maintained. There is also a blank check facility.
- Works with all standard filing systems. Generates header code for RFS ROMs to allow Basic programs etc. to be stored in EPROM. More than one file per ROM permitted.
- Programs the following EPROMs: From 2K to 32K: 2516, 2716, 2532, 2732, 2764, 2764A, 27128, 27128A, 27256 (Both 12.5V and 21V).

£75 (£3 Carr)

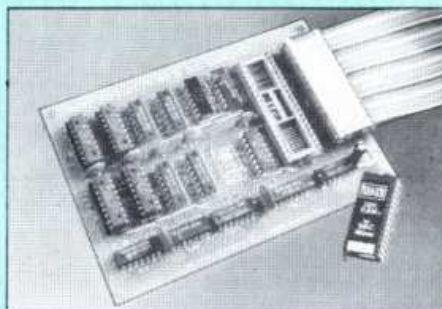
TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- ERASER EB - Standard version erases up to 16 chips. **£28 (carr £2)**
- ERASER GT - Deluxe version erases up to 18 chips. Has automatic safety cut-off to switch off the UV lamp when opened. **£30 (carr £2)**
- Spare UV tubes. **£9**

32K

SHADOW RAM-Printer Buffer Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer - type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.

- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free - 5 times as much as normal.

- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This product is recommended as an ideal complement by Computer Concepts.

- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.

- Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15, 21, 138, 145, ADVAL etc). Please note only a 12K printer buffer can be used with Wordwise or Wordwise-Plus; due to the way they are written.

- Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

Only £59 (carr £2)

(Price includes a comprehensive manual and the ROM)

INCREDIBLE WORDPROCESSING DEAL

Watford's 32K SHADOW RAM CARD and Computer Concept's INTERWORD Wordprocessor package.

at Only **£89** (carr £2)

Continued

BOOKS (No VAT on Books)

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BEEB VIDEO DIGITISER

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem.

The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.

Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional * commands. The package is designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROM's to work on it.

A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image.

Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£109 (Carr. £3)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual
(BBC B+ and Master compatible, except Master with Econet)

Magazine Maker

(As seen on TV)

A combination of the AMX Pagemaker and Watford's Beeb Video Digitiser.

Using any video that provides a composite signal and the digitiser, images from a camera or TV can be converted into a graphics screen on the BBC Micro.

They can then be used within AMX Pagemaker to illustrate magazines or newsletters - in fact anything that needs to be created on A4 size paper.

With Pagemaker's many features, a variety of pictures can be composed - the only limit being the imagination.

Pictures can be doctored using Pagemaker's graphics option to produce any number of effects.

Text can be formatted around the digitised photo on screen using the facilities available, which include 16 typefaces, character and pattern definer, text formatting and the ability to load in wordwise and viewfiles plus much more.

Once created the picture can be printed out.

The Magazine Maker is suitable for any use that requires illustrated documents.

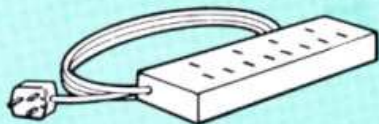
Complete Package £129.00 (carr. £3)

SURGE PROTECTOR Plug

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Protection for only **£7.50**

4 WAY MAINS DISTRIBUTION SOCKET



4 way top quality mains trailing sockets. Supplied wired up with mains plug ready for use. Can be screwed to floor or wall if required. Very useful for tidying up all the mains leads from your peripherals.

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A 4 way mains distribution unit as above with a built-in Surge Arrester, providing protection for your complete computer system

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SPARES for BBC Micro

Keyboard	£43	Keystrip	£2
UHF Modulator	£4	Case	£20
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Replacement FLEXIBLE 17 way Keyboard Connector £3

8 WAY DIP SWITCHES

With these DIP switches soldered to their keyboard, any BBC B or B+ owner can take full advantage of the fast disc drives that we supply by configuring his BBC for fast disc drive operation.

Excellent value for money at **£1.00**

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Convert two single Disc Drives into one Dual Drive with this simple external unit (suitable for disc drives with PSU).

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Supply from BBC power supply to standard Disc Drive connector.

Single **£3.00** Dual **£3.75**

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BBC to Disc Drives Ribbon Cable.

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E.B.N., Elisenstrasse 13, 1000 Berlin 41. Tel: (030) 7952057.

Lendac Data Systems, Unit 31, IDA Enterprise Centre, Pearce Street, Dublin 12. Tel: 710796.

Scientex P.V.B.A., Zilvermidstraat 2, B-2000 Antwerpen, Belgium. Tel: 03 233 59 06

Techno-matic Data, Holbergsgade 19, 1057 København K, Denmark

*Velobyte, Scheaedyksadyk 5a-6a, 3011 EB Rotterdam, Holland. Tel: (010) 413 8197/414 5171.

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*Acorn/Watford Referral Centres.

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ROM EXTRACTION TOOL

This extremely useful tool allows you trouble free chip removal from your computer by distributing the removal force over the whole body of any 24 or 28 pin chip.

£2

ATTACHE CARRYING CASE for BBC Micro

This attache carrying case is attractively finished in mottled antique brown leatherette. An ideal and safe way of carrying your BBC Micro around. Supplied with two Keys.

Price: **£12** (£2 carr.)

28 pin ZIF SOCKET (Textool) **£6.95**

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DANCING ON A HIGH WIRE

Continuing Archie to Beeb communications

Last month, I explained how to transfer BBC files to and from an Archimedes. This is only one of the many uses of the serial port, and this month, I am going to explain how to send and receive data for use within your own applications.

The Serial port

Programming the serial port (known as the RS423) was explained in great detail last month, therefore unless you are fully conversant with parity and baud, I suggest that you get hold of a copy of last month's magazine as it is easy to get bogged down with the technicalities of data transfer.

Real Time Applications

Transferring files across the serial port, although useful, is not very exciting, and does not exploit the interface to its full potential.

If a system is running a *real time* application via the serial port, the action the computer takes depends entirely upon the data received. As a simple example, two numbers may be received via the port, and the computer may be asked to display their product. The result will depend entirely on the two numbers received, which are not predetermined. This is obviously a useless exercise, however, it should illustrate simple real time dependence.

Up until now, everything I have been transmitting and receiving has been alphanumeric characters in ASCII. To send numbers, eg 12345 we could send the ASCII codes for each digit, for example a 1 then a 2 and so on... This, however, is not very useful, as it takes too much time and requires complex decoding at the receiving end.

There is another way of sending numbers. As only ASCII characters can be sent, we need a suitable coding system. Every byte in the BBC B is 8 bits long. It can, therefore, hold any number up to 256. If we want to hold bigger numbers we have to use more bytes, in which case the first byte holds the

units, the second holds the 256's, the third holds the 512's and so on. Therefore if we want to send the hexadecimal number &1E2D, we send CHR\$(&1E) followed by CHR\$(&2D). Notice that the bytes are sent in reverse, this is merely a protocol adopted by many manufacturers. We could just as easily send the bytes the other way round. In this case we are sending a two byte number, and so, both sending and receiving stations must know this. Any number less than 256 must be followed by a padding zero.

Assuming that we are using an 8-bit word length for transmission, we can send any positive character between 0 and 255. Obviously, for any practical purposes we would want to send larger numbers. The number of bytes used to represent each number will limit the size of it. If two bytes are used, then any number from 0 to 65536 can be sent, however, if four bytes are used, much larger numbers can be represented. In the following examples two bytes are used, but you may want to use more in your own applications.

Of the two bytes sent to represent one number, the first are the "units" and the second is the 256's; therefore, if the receiving station receives two bytes &AB and &1E, then the number represented can be calculated by adding the product of 256 and the second number to the first number. In this case, the number is $(\&100 * \&1E) + \&AB$ which equates to &1EAB.

An Implementation

To make life easier, it is preferable to have procedures to send and receive the two byte numbers. As an example of two byte arithmetic, programs 1 and 2 will add two numbers received via the serial port and then send the answer back down the port, to the original sender. Program 1 should be run on the computer you want to send, with Program 2 on the computer you wish to do the arithmetic, and return the answer. Throughout this article I will be using baud rates of 1200 bps and 8-bit word length with negative parity and one stop bit, all are set up via FX calls (which were explained last month).

Any combination of BBCs can be used, together with the patch lead, (again, described last month). If you do not have a patch lead yet, they are still available from the address given in the factfile at the end, or you could alternatively wire up one yourself.

To operate the data transmission system, enter both of the programs and run them. Program 2 will wait for program 1 to send the two numbers, which you will be asked for. An incorrect answer will be returned if the sum is too large (ie greater than 65535).

If all is well, the sum should be displayed on the original sender's VDU, although all arithmetic was performed by the other computer. Incidentally, this is the way in which all co-processors work in conjunction with the main processor. The program will run continuously, so you can add up numbers to your heart's content!

In both these programs, PROCsend(A) splits the integer A into two bytes and sends it as two 8-bit ASCII characters. FNreceive waits for two characters from the serial port and then combines them to make one integer. These procedures will be used in all future examples. By creating your own algorithms, floating point numbers may also be sent. One method is to send an extra byte indicating the position of the decimal point.

Battleships

Program 3 is a fully working (and practical) demonstration of how the serial port can be used within your own applications. It is a version of the popular battleships game for two players.

Each player sits at their own computer, they place their ships on the grid, and attempt to guess where the other players ships are. Each player has eight ships of five different sizes - ranging from tug to battleship.

The program is technically very simple and works as follows:

- Both players run the program on both computers.
- Both computers create a random number between 0 and 255. The numbers are sent to each other. Whichever computer has the higher number, has first guess!
- Player A (using computer A) enters a guess in the form of a two character coordinate, eg D7. This coordinate is then converted into a number in the range 0 to 99 and sent to the other computer.
- Computer B can then return any of four different types of number: A number in the range 1-8 indicates a hit of that ship number. A return of 255 indicates that the square has already been guessed, so try again. A return of 0 is a miss, and a

values in the range 11-18 indicates a hit and destroy of the ship number given minus 10.

- Computer B then guesses, and this continues until one player's ships have all been destroyed.

Each player has two grids on the screen: The first, labelled *Your Ships* displays the position of his ships and his opponent's hits and misses. The second grid, labelled *Opponents Ships* shows their previous hits and misses.

Type in the program exactly as shown, on both computers. You can of course type it in on one and send it down the serial port to the other using last month's programs. *If the program is being run on any non-Archimedes machines, line 1770 should be deleted.* This delay is required due to the operating speed of the Archimedes! Both players should place their ships as directed. All parts of one ship must be on adjacent squares, but ships do not have to be straight, though players may wish to agree to use only straight ships.

Whichever player goes first should then enter his guess. If he hits his opponent, then the ship number will be displayed on the right hand grid. If he misses, then the square will be marked with a cross. His opponent's left hand grid will be marked identically.

In this short series, I have explained the basic concepts of serial port programming, such that you should now be able to write your own applications with ease. A&B would, of course, be very interested in any programs which you may write using the serial port.

Factfile

The patch leads to link two computers are available from *J.D.Custom Electronics, 18 Deansway, Edgware, Middlesex, HA8 9NL. ☎ 01 906 1225.*

```

10 REM PROGRAM ONE
20 REM Serial port local ch
at (local echo)
30 REM For entire BBC range
with RS432
40 REM By Michael Spalter S
eptember 1987
50 REM (C) A&B Computing '8
B
60 REM Set RX and TX baud r
ates
70 *FX 7,4
80 *FX 9,4
90 REM Set parity, word len
gth and stop bits
100 *FX 156,158
110 REM Enable RS432 serial
port
120 *FX 2,2
130 REPEAT
140 REM Check keyboard buffe
r for character
150 IF ADVAL(-1)=0 OR ADVAL(
-3)=0 THEN GOTO 230
160 REM Pull character from
keyboard buffer
170 A%=&91 : X%=&00 : Y%=(U
SR(&FFF4) AND &FF0000)DIV &100
00)
180 REM Transmit character

```

```

190 *FX 3,1
200 VDU Y%
210 IF Y%=13 VDU 10
220 *FX 3,0
230 REM check serial input b
uffer for character
240 IF ADVAL(-2)=0 THEN GOTO
290
250 REM Pull character from
serial input buffer
260 A%=&91 : X%=&01 : Y%=(U
SR(&FFF4) AND &FF0000)DIV &100
00)
270 REM Send recieved charac
ter to VDU
280 VDU Y%
290 UNTIL FALSE

```

Program 1- Number display program, for the sending computer

```

>
10 REM PROGRAM TWO
20 REM BBC Data-File Upload
er
30 REM (Also for spooled BA
SIC)
40 REM By Michael Spalter 9
/87
50 REM A&B Computing '88
60 filename$="Fname"
70 *FX 156,158
80 *FX 7,4
90 *FX 8,4
100 X=OPENIN(filename$)
110 MODE 0
120 PRINT "Ready to Send....
....Press <SPACE BAR> to start
."
130 REPEAT UNTIL INKEY(-99)
140 PRINT "Sending Data Now
....."
150 check=0
160 REPEAT
170 Y%=BGET #X
180 A%=138 : X%=2 : CALL &FF
F4
190 IF Y%>31 THEN VDU Y%
200 I=INKEY(1)
210 check=check+Y%
220 UNTIL EOF #X
230 CLOSE #X
240 PRINT "Uploading Comple
te. Data Checksum=";check'
250 END

```

Program 2- Number arithmetic program, for the second computer

```

10REM BattleShips - A two p
layer interactive game
20REM By Michael Spalter,
September 1987
30REM For A&B Computing
40REM For ANY BBC Micros
50:
60MODE 1
70:
80PROCscreen_display
90PROCinit
100PROCplace_ships
110PROCcomms_setup
120PROCwho_goes_first
130:
140IF mefirst% THEN PROCmy_g
o
150:
160REPEAT
170PROCis_go
180IF hewon% THEN GOTO 200

```

```

190PROCmy_go
200UNTIL hewon% OR iwon%
210IF iwon% THEN PRINT "You
Win, well done!" : END
220PRINT "He Wins, Bad Luck!
" : END
230:
240END
250:
260DEF PROCinit
270DIM square(99)
280DIM hisquare(99)
290DIM ship_size(8)
300hewon%=FALSE : iwon%=FALS
E

```

```

310his_ships_left=8
320my_ships_left=8
330RESTORE 400
340FOR count=1 TO 8
350READ number
360ship_size(count)=number
370NEXT count
380*FX 15
390ENDPROC
400DATA 5,5,4,4,3,3,2,2
410:
420DEF PROCscreen_display
430PROClines
440PROCgrid(79,450,500)
450PROCgrid(700,450,500)
460PROCaxes
470VDU 28,1,30,38,21
480VDU 23;8202;0;0;0
490ENDPROC
500:
510DEF PROCgrid(X,Y,size)
520step=size/10
530FOR A=X TO X+size STEP st
ep
540MOVE A,Y : DRAW A,(Y+size
)
550NEXT A
560FOR A=Y TO Y+size STEP st
ep
570MOVE X,A : DRAW (X+size),
A
580NEXT A
590ENDPROC
600:
610DEF PROClines
620MOVE 0,0 : DRAW 1279,0
630DRAW 1279,1023 : DRAW 0,1
023
640DRAW 0,0
650MOVE 0,375 : DRAW 1280,37
5
660PRINTTAB(5,1); "YOUR SHIPS
";SPC(7); "OPPONENTS SHIPS"
670MOVE 625,375 : DRAW 625,1
024
680ENDPROC
690:
700DEF PROCaxes
710VDU 5
720C=32 : B=82
730FOR turn=1 TO 2
740A=935 : D=440
750FOR count=9 TO 0 STEP -1
760MOVE C,A : PRINT;count;
770A=A-50
780NEXT count
790FOR count=ASC("A") TO ASC
("J")
800MOVE B,D : PRINT;CHR$(cou
nt);
810B=B+50
820NEXT count
830C=660 : B=710
840NEXT turn
850VDU 4
860ENDPROC

```


COMPUTER COMMUNICATIONS

```

870:
880DEF FNcode(code$)
890check1$=LEFT$(code$,1)
900check2$=RIGHT$(code$,1)
910IF ASC(check1$)<65 OR ASC
(check1$)>74 THEN =%FF
920IF ASC(check2$)<48 OR ASC
(check2$)>57 THEN =%FF
930:
940left=ASC(check1$)-65
950right=ASC(check2$)-48
960square=(right*10)+left
970=square
980:
990DEF FNdecode(code)
1000left$=CHR$((code MOD 10)+
65)
1010right$=CHR$((code DIV 10)
+48)
1020square$=left$+right$
1030=square$
1040:
1050DEF PROCplot(square,grid,
type)
1060xord=((square MOD 10)*50)
+83
1070yord=((square DIV 10)*50)
+454
1080IF grid=2 THEN xord=xord+
621
1090:
1100IF type=0 THEN type=9:GOT
O 1210
1110IF type=9 THEN GOTO 1290
1120IF type<10 THEN 1360
1130IF type<>12 THEN 1210
1140GCOL 0,3
1150MOVE xord,yord
1160DRAW xord+40,yord+40
1170MOVE xord+40,yord
1180DRAW xord,yord+40
1190ENDPROC
1200:
1210GCOL 0,(type-9)
1220MOVE xord,yord
1230MOVE xord+42,yord
1240PLOT 85,xord+42,yord+43
1250MOVE xord,yord
1260PLOT 85,xord,yord+43
1270ENDPROC
1280:
1290GCOL 4,0
1300MOVE xord+22.5,yord+5
1310DRAW xord+22.5,yord+40
1320MOVE xord+5,yord+22.5
1330DRAW xord+40,yord+22.5
1340ENDPROC
1350:
1360xord=xord+7 : yord=yord+3
5
1370MOVE xord,yord
1380GCOL 0,2
1390VDU 5,(type+48),4
1400ENDPROC
1410:
1420DEF PROCplace_ships
1430PRINTTAB(0,0); " Positio
n all 8 ships on the grid."
1440PRINT " Move cursor and p
ress RETURN to place";
1450current=0
1460PROCplot(current,1,9)
1470FOR ship=1 TO 8
1480size=ship_size(ship)
1490COLOUR 2
1500PRINTTAB(2,5); "Please pos
ition ship no.";ship;" (size "
;ship_size(ship);)";
1510COLOUR 3
1520REPEAT
1530PROCplot(current,1,9)

```

```

1540IF INKEY(-58) AND current
<90 THEN current=current+10
1550IF INKEY(-42) AND current
>9 THEN current=current-10
1560IF INKEY(-26) AND (curren
t MOD 10)<>0 THEN current=curren
t-1
1570IF INKEY(-122) AND (curren
t MOD 10)<>9 THEN current=curren
t+1
1580IF NOT INKEY(-74) THEN GO
TO 1760
1590IF square(current)<>0 THE
N GOTO 1760
1600PROCplot(current,1,9)
1610IF size=ship_size(ship) T
HEN 1690
1620:
1630IF (current MOD 10)<>9 :
IF square(current+1)=ship THEN
1690
1640IF (current MOD 10)<>0 :
IF square(current-1)=ship THEN
1690
1650IF current>9 : IF square(
current-10)=ship THEN 1690
1660IF current<90 : IF square
(current+10)=ship THEN 1690
1670GOTO 1750
1680:
1690PROCplot(current,1,9)
1700PROCplot(current,1,ship)
1710PROCplot(current,1,9)
1720size=size-1
1730square(current)=ship
1740
1750PROCplot(current,1,9)
1760PROCplot(current,1,9)
1770FOR delay=1 TO 1000 : NEX
T delay : REM delete unless on
Arcimedes
1780UNTIL size=0
1790NEXT ship
1800PROCplot(current,1,9)
1810:
1820COLOUR 2
1830PRINTTAB(1,5); "Are you ha
ppy with this layout (Y/N)";
1840*FX 21,0
1850G$=GET$:IF G$="N" THEN RU
N
1860CLS
1870ENDPROC
1880:
1890DEF PROCcomms_setup
1900*FX 7,4
1910*FX 8,4
1920*FX 156,158
1930*FX 2,2
1940ENDPROC
1950:
1960DEF PROCsend(A)
1970*FX 3,3
1980VDU (A MOD 256)
1990*FX 3,0
2000ENDPROC
2010:
2020DEF FNreceive
2030REPEAT UNTIL ADVAL (-2)<>0
2040A%=%91 : X%=%01 : B=((USR
(%FFF4) AND %FF0000) DIV %10000
)
2050=B
2060:
2070DEF PROCwho_goes_first
2080PRINT "Waiting for opponen
t to finish....";
2090M=RND(255)
2100PROCsend(M)
2110N=FNreceive
2120IF M>N THEN mfirst%=TRUE

```

```

ELSE mfirst%=FALSE
2130CLS
2140IF NOT mfirst% THEN PRIN
TTAB(1,1); "Your opponent goes
first."
2150IF mfirst% THEN PRINTTAB
(1,1); "Okay, You go first....
";
2160*FX 15
2170I=INKEY(100)
2180CLS
2190ENDPROC
2200:
2210DEF PROCmy_go
2220CLS
2230PRINTTAB(1,3); "Please ent
er your guess (eg D6) ? ";
2240INPUT " "cord$
2250my_guess=FNcode(cord$)
2260IF my_guess<0 OR my_guess
>99 THEN 2220
2270PROCsend(my_guess)
2280his_reply=FNreceive
2290IF his_reply=0 THEN PRINT
TAB(15,5); "Missed!";PROCplot(
my_guess,2,12);I=INKEY(200):EN
DPROC
2300IF his_reply=%FF THEN PRI
NTTAB(5,5); "Already Guessed -
Try Again"; : I=INKEY(150) : G
OTO 2220
2310his_square(my_guess)=his_re
ply
2320PROCplot(my_guess,2,his_r
epl)
2330IF his_reply<10 THEN PRIN
TTAB(15,5); "HIT!"; : I=INKEY(2
00) : ENDPROC
2340PRINTTAB(5,5); "HIT & DEST
ROYED!";
2350PROCdestroy(his_reply)
2360his_ships_left=his_ships_
left-1
2370IF his_ships_left=0 THEN
iwon%=TRUE
2380I=INKEY(200)
2390ENDPROC
2400:
2410DEF PROCchis_go
2420CLS
2430PRINTTAB(1,3); "Waiting fo
r his guess....";
2440his_guess=FNreceive
2450PRINTTAB(5,5); "He guesses
: ";FNdecode(his_guess);
2460IF square(his_guess)=0 TH
EN GOTO 2590
2470IF square(his_guess)=%FF
THEN GOTO 2660
2480:
2490ship_size(square(his_gues
s))=ship_size(square(his_gues
s))-1
2500IF ship_size(square(his_g
uess))=0 THEN GOTO 2710
2510:
2520PRINT; "(HIT!)";
2530PROCsend(square(his_guess
))
2540square(his_guess)=%FF
2550PROCplot(his_guess,1,10)
2560I=INKEY(200)
2570ENDPROC
2580:
2590PRINT; "(MISS!)";
2600PROCsend(0)
2610PROCplot(his_guess,1,12)
2620square(his_guess)=%FF
2630I=INKEY(200)
2640ENDPROC
2650:

```



```

2660PRINT;" (AGAIN!)" ;
2670PROCsend(255)
2680I=INKEY(150)
2690GOTO 2420
2700:
2710PRINT;" (HIT & DESTROYED)"
;
2720PROCsend((square(his_gues
s)+10))
2730square(his_guess)=&FF
2740PROCplot(his_guess,1,10)
2750my_ships_left=my_ships_le
ft-1
2760IF my_ships_left=0 THEN h
ewon%=TRUE
2770I=INKEY(200)
2780ENDPROC
2790:
2800DEF PROCdestroy(dest)
2810FOR loop=0 TO 99
2820IF hisquare(loop)=dest OR
hisquare(loop)=dest-10 THEN P
ROCplot(loop,2,10)
2830NEXT loop
2840ENDPROC
2850:

```

Program 3 - Battleships Game for two computers.

Figure 4 - Setting of word type via *FX 156,n

n	Word length	Parity	Stop Bits
130	7 bits	even	2
134	7 bits	odd	2
138	7 bits	even	1
142	7 bits	odd	1
146	8 bits	none	2
150	8 bits	none	1
154	8 bits	even	1
158	8 bits	odd	1

Figure 5 - Setting of baud rate using *FX 7 or 8,n

n	bps
1	75
2	150
3	300
4	1200
5	2400
6	4800
7	9600
8	19200

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The BBC micro continues to age gracefully and in spite of the inevitable advances in technology spawning more powerful machines on the market – not least the Archimedes – however, the machine's life as a serious micro continues with the recent publication of no less than three versions of the programming language C, previously available only on more powerful computers.

In this article I will be looking at each of these implementations – from Acornsoft, Beebug and Brasscourt Ltd. I will also present some short examples of C code with comparative speeds for the alternative versions and equivalent BBC BASIC programs. First, however, I should outline the nature of the language and its potential interest to BBC micro owners.

The C programming language

Two of the three versions reviewed here provide no tutorial content on the nature of C, referring readers instead to the definitive specification of Kernighan & Ritchie's *The C Programming Language* and other popular textbooks on the market.

C was originally designed as a system language for UNIX operating systems. Both the language and a number of utilities written in it are normally supplied with UNIX systems; this explains its curious mixture of high and low level facilities, on the one hand providing structured programming on a par with PASCAL but on the other allowing low level access to machine addresses and registers and the ability to manipulate and shift bit patterns. C has become more popular, as both a system language for other operating systems and as a general purpose language. For example, its succinct code, powerful range of operators, more modern control structures and (comparable) ability to compile into fast and efficient native machine code have made it a serious rival to the traditional FORTRAN as a scientific programming language.

UNIX, is an operating system you will either love or hate, however the power of UNIX lies in its many utilities which can be invoked by commands or linked in shell programs. It does, however, require the user to memorize dozens of very brief and arbitrarily named commands in order to use it, in other words, it is a system for professionals

We assess the three best C's on the market

using it day in and day out, it is hostile to the occasional user. Its philosophy is almost entirely opposite to the direct manipulation interfaces within WIMP (Windows Icons Mouse Pointer) environments such as those found on the Macintosh and the Lisa.

C has inherited some of its characteristics from UNIX. The emphasis is on compactness and efficiency rather than on easy access and readability. BASIC programmers may find learning C a tougher proposition than, say, PASCAL. On the other hand, with its very compact and efficient methods of coding, I can well understand how an experienced programmer could grow very attached to it. There is, however, a risk that programs may be made succinct to the point of incomprehensibility to others. Consider for example the following line of C code:

```
while (y=x[i++]) sum+=y;
```

This statement is best understood from the inside out. *i* would be some previously initialised integer variable which is being incremented to read values from an array of numbers *x*. The statement *i++* means increment *i* by 1 (*i=i+1*) after completing any operation in which it is embedded – in this case the assignment of a value of *x* into *y*. If it were written *++i* then incrementation would occur first.

The while construct means that so long as the expression in brackets evaluates to TRUE then then the following statement (or group of statements enclosed in braces) will be executed. The reason that the assignment can be included in the logical expression is

that it returns the value of whatever is assigned. Since C treats zero as FALSE and non-zero as TRUE the loop will continue until a zero value is found in the array. The statement *sum+=y* uses one of C's short cut assignment operators to add *y* to the current value of *sum*. The equivalent in BASIC would involve all this:

```
100 REPEAT
110 y = x(i)
120 IF y = 0 THEN 150
130 sum=sum+y
140 i = i + 1
150 UNTIL y = 0
```

C is, a compiled language which means programs are written as a text file using a text editor or word processor and are compiled into an executable image before running. This would normally be native machine code though memory constraints on the BBC micro have forced both Acornsoft and Beebug to use a pseudocode which is actually interpreted within the C environment.

The process of programming is, however, identical to that of a standard C implementation. Unlike most high level languages, C has only a small number of reserved words such as FOR, DO, WHILE, IF... it relies on the linking of a number of library functions held in disc files during compilation. There are two distinct phases: first the text source is compiled into object code (an intermediate file). Then the object code is linked with library files (system supplied and users' own) to produce the executable image.

Compiler versus interpreter

The advantages of compilation are normally that the source text can be written with a full screen editor with no overheads for the use of spaces, comments and long variable and procedure names and execution speed of a developed program. The latter cannot be assumed for the pseudocode of the BBC versions, however, so will be tested in comparison with BASIC later in this article. The disadvantages compared with an interpreted language are that the user must wait for the

program to compile and link before being able to test it and one cannot test the value of variables directly by PRINTing them after execution.

A C program consists of a number of named *functions* one of which must be called **main()** and is the calling and exiting function for the whole program. Functions need not return values, however, so may effectively be thought of as procedures. The ability to pass pointers to memory addresses, as well as variables, in the argument list to functions extends the power well beyond BBC BASIC, however, it means that arrays can be passed as parameters and also that multiple values can be returned by a function.

A powerful facility is provided in the form of the C *preprocessor* which processes commands beginning with the # symbol prior to executing the program. The most commonly used preprocessor commands are **#include** and **#define**. The former is followed by the name of a text file whose contents is inserted in the program file at the position of the **#include** statement before compilation. **#define** is a very useful macro replacement facility. At its simplest, it can be used like PASCAL's constant data type, as in **"#define MAXNO 300"** which would replace all occurrences of the name MAXNO by the number 300. Defines can also include program commands, however, eg **"#define BELL putchar(7)"** which makes BELL perform the equivalent of VDU7. More powerful still, defines can take arguments as in **"#define MODE(m) putchar(22); putchar(m)"**.

Although defines can be used as sub-routines, this carries a large overhead in space – though savings in execution time – as compared with functions. The point is that the commands in the define will be inserted in full wherever the defined word appears, whereas function code is written only once. It is common to use groups of **#define** statements to define constants and brief commands. These are often placed in separate text files called "header files" which are **#included** at the top of the program where needed. Both the Acorn and Beebug versions require inclusion of header files associated with particular sections of the library routines according to which functions you need to access.

For the BBC Micro user, there are distinct reasons why C has its advantages over BASIC, of the many, I the most useful applications are listed below.

As a system language. This is the traditional and original use of C, for writing utilities, language interpreters or compilers and the like. However, this requires that the system generate not just stand-alone code which runs in the absence of the C environment but native machine code. It would be nice if C could dispense with the need for Assembler programming but this is a tall order for such a small machine as the BBC micro.

For educational purposes. Like other languages (eg PASCAL, microPROLOG)

developed for the BBC, an advantage is that home and educational users can learn a language to be used later in a more powerful and appropriate environment. For this purpose, as full and as standard as implementation as possible is desired – whereas execution speed relative to BASIC is a less important consideration.

For preference in user's own applications. Some programming users might prefer C to BASIC because of its additional operators and programming facilities or in the hope of achieving significantly faster execution times in speed critical applications. An important consideration here, apart from execution speed, is the degree of access to the BBC's operating system and graphics provided and also the provision of a library of mathematical functions (now virtually standard in C implementations). In other words, the implementation should allow the user to do anything which can be done in BBC BASIC.

For portability to other machines. C is a favoured language for professionals where portability is important. This is because C is both very widely available and highly standardised in its alternative implementations. Hence, non-machine specific applications may be coded on the BBC micro – within the machine's constraints – and ported to other systems. Possible applications might include such things as statistical analysis packages, adventure designing systems and language interpreters. The text need not necessarily be retyped even. For example, BBC computers are frequently used as terminals to mini and mainframe computers and the terminal software such as Acorn's *Terminal* ROM may allow direct transfer of text files from BBC disc to the host machine.

Acornsoft C

The Acornsoft versions comes with two discs: a 3½" version for the Master Compact configured for ADFS, and a 5½" version configured for DFS and a large spiral bound manual. The system is configured for use with the B+ and Master series (loading ROM images into all four sideways RAM banks) or for use with a 6502 second processor/Master Turbo. It may also be possible to run it on a Model B fitted with 64K sideways RAM, although you will have to write your own software for loading the ROM images.

The documentation, though extensive, provides no attempt to describe the C language itself – let alone provide any tutorial content. Instead, there is an assertion that the Kernighan and Ritchie definition of the language has been implemented with certain extensions and omissions which are detailed. The library functions and macros provided are summarised in Table 1. These are clearly documented in the manual and include a standardised implementation of all the C routines for input/output (I/O) handling including formatted input and output using files as well as keyboard and VDU, memory and string operations, type classifications and conversions and so on. In addition, there are machine specific system routines for handling DFS and ADFS at lower levels. A powerful environment is provided including a text editor and powerful command line facilities. Superficially at least, this appears as a powerful and standardised implementation of C for the BBC micro.

There were no instructions for transferring the DFS versions to ADFS as I wished to do for the Master 128. Indeed, the system is virtually unusable on DFS since you have only

TABLE 1

Library functions and macros and associated header files provided by Acorn and Beebug C

Function group	ACORN		BEEBUG	
	Present	Header	Present	Header
Standard input/output	yes	h.stdio	yes	h.stdio
Low level input/output	yes(1)	various	no	
System calls	yes(2)	various	yes	h.call
OS routine names	yes	h.osdefs	yes	h.call
Heap allocation	yes	h.malloc	yes	h.stdlib
Memory operations	yes	h.string	yes	h.string
String operations	yes	h.string	yes	h.string
Character classification	yes	h ctype	yes	h ctype
Type conversions	yes	h.cvt	yes	h.stdlib
Assert macro	yes	h.assert	yes	h.assert
Random number functions	no		yes	h.stdlib
Time functions	no		yes	h.stdlib
Sound/envelope	no		yes	h.stdlib
Graphics/vdu commands	no		yes	h.stdlib
Mathematical constants/ Numerical limits	yes	h.maths	yes	h.maths/ h.limits/ h.float
Mathematical functions	no		yes(3)	h.maths
Variable arguments	no		yes	h.stdarg
Non-local jumps	yes	h.setjmp	yes	h.setjmp

NOTES

- (1) Used by minlib
- (2) Much more extensive system specific functions in Acorn implementation, especially for filing system operations
- (3) Available at extra cost

about four files free with all the system files which need to be present, and since writing one program creates several files you are limited to one development per disc! The ADFS transfer is far from obvious and took me several phone calls to Acorn to discover.

The text editor supplied is invoked by `EDIT <filename>` and may be used for the creation of the program source files which must be placed in the `c` subdirectory. This editor is obviously a modified version of the one provided as standard on the Master 128 though it has one or two minor improvements: for example, the file name is remembered when saving and `<Shift-F4>` automatically returns you to `C` without prompting for the language name. A large chapter in the manual is devoted to describing the editor.

Once the source file is created you must compile and link it. This can be done by separate commands of `COMPILE` and `LINK` which the `C` command line interpreter understands. The final program is then run by simply typing the filename (the system automatically keeps source, object and executable images in separate directories for you). To compile, link and run a program in one go you type `COMPILE <filename> -l -r` though this denies access to certain options, for example, to link files other than the standard library at the `LINK` stage.

Herein lies another drawback of the Acorn system: this large library file is linked by default, regardless of how many functions you actually access producing irritating overheads in the length of time taken to compile the code and in the length of code produced even from a short text file. You can, however, change the `LINK` option to include one of several alternative smaller libraries if there are groups of functions that you are not going to need.

A strong feature of the Acorn `C` system commands is the various options provided. For example, standard UNIX operators are available for redirecting the input and output streams (set by default to the keyboard and VDU) after compilation of the code. Hence, you may develop a program to print results of some computation on the screen. If you then type `<filename> > <outfile>` the output will not be seen on screen but redirected into the named output file. Similarly, input from the keyboard can be redirected to a file. To achieve the same sorts of effects in BASIC you have to mess about with `*SPOOL` and `*EXEC` commands in the programs. Another advantage over BASIC is that all input and output files are pure text and so may easily be created and modified with a word processor or incorporated into a document.

My main complaint with the Acorn `C` system, apart from the slow and inefficient compile and link processes, is the omission of essential library functions. By sticking rigidly to the Kernighan and Ritchie standard they apparently feel justified in omitting both a mathematics library (square roots, logs, trig functions etc) and any form of machine-

specific access. There is no sound or envelope command, no time or random number functions, no graphics commands of any kind, not even mode or vdu! These omissions are astonishing and frankly quite ridiculous. You can, in principle, write your own graphics library, building it up tediously from standard `C` commands: eg `putchar(c)` does the equivalent of a single VDU command, and control characters can also be sent by printing strings including a backslash followed by the control code in octal! Since Acorn `C` (unlike Beebug) does not support the creation of functions with variable argument lists, I cannot see how one can implement a proper vdu command which would make graphics library development a lot easier.

Even users who feel able to develop such libraries might well ask why Acorn expects them to. There are possible further problems also. For example, implementing time functions can in theory be achieved by using "call" or "oscall" commands to invoke the appropriate OSWORD routines. However, this requires one to be able to read numbers pointed to by the addresses in `X` and `Y` registers on return of the routine and I have so far been unable to find a means of persuading the `C` compiler to assign a computed address to a pointer so that its value can be accessed. The documentation provides no advice on how this can be done and the Acorn language experts - that I phoned, were unable to provide a solution.

An efficient maths library cannot be written in `C` itself and must therefore be provided as part of the library system. I have pursued this point with Acorn's technical staff who have agreed that this is a critical omission and discussed the matter with senior management. The outcome relayed to me is that Acorn do not have the resources to develop this in house but might be interested in bids from freelance programmers. The same goes for a stand-alone generator - at present, Acorn `C` programs can only be run within the `C` environment and not transported to standard BBC micros. The omission of general purpose programming facilities (maths, graphics etc) and concentration on filing system routines might indicate that it was designed for the traditional `C` role of "system language" - indeed that was the initial justification offered to me by Acorn staff. However, its inability to provide stand-alone, let alone true machine code makes it an impractical alternative to assembler at present.

Without wishing to be too unkind, the Acorn implementation of `C` seems to me to be a classic example of a mismatch between technical design and marketing requirements. Someone has spent a lot of time and effort developing - in a sense - a powerful and well documented system language for the BBC micro. Unfortunately, the technical design specification seems not to have reflected the most elementary marketing considerations. No one appears to have thought about exactly who is going to use the language for

what purpose. The only purpose Acorn were able to offer at the conclusion of my discussions with them was the educational one. This might justify some sales, if there were no better alternative on offer - but read on!

Beebug C

After several weeks of struggles and frustrations with Acornsoft `C`, the Beebug version turned up. What a relief! Like the Acorn version it provides a standard implementation suitable for those wishing to learn the language and/or write code which can be ported to other machines. The standard libraries are as full and as standardised - and hence almost identical. The detailed filing system functions (beyond standard and portable input/output) are not provided but can easily be written by users in their own libraries by use of OS calls if needed.

Apart from these basic similarities, I have to say that the Beebug implementation is superior in so many respects that they are worth enumerating:

- The two ROMs provided will run on any model of the BBC series.
- The library directory is set by standard `*LIB` command and can thus be placed on a separate disc to save space, making usage under DFS a more practical proposition. Transfer to ADFS is also straightforward and documented.
- Programs compile and link in roughly half the time taken on the Acorn system (see Table 1), reducing much frustration when developing and testing code.
- The linker intelligently selects only those functions from the library actually accessed by the user's program thus producing much more compact files of executable code. Furthermore a powerful library handling utility (written in `C`) is provided which enables users to edit the library both by deleting unwanted functions and adding ones of their own.
- Variable argument list facilities for users' own functions are provided via system macros allowing the development of flexible functions as well as the very useful system provided vdu command. This facility is not possible in standardised, portable `C` but is very useful to have in a particular implementation.
- A number of machine specific functions are provided, including functions for setting and reading the system clock, a random number generator, sound, envelope, mode, colour, gcol, move, draw, plot etc as well as a general purpose vdu command (accepting a sequence of numbers unlike the `C` intrinsic `putchar`) which makes development of users own graphics libraries very simple.
- Slightly better compiler diagnostics are provided compared with the Acorn system (which are also good) but much better run-time diagnostics. Whilst an execution error on the Acorn system will generate such helpful remarks as "bad opcode", the Beebug system will identify the nature of the error and the number of the line in the original

source file responsible! Error messages can be omitted on tested code by use of options at either the compilation or linking stage, resulting in slight savings in compiled code length and execution time.

● At moderate extra cost, Beebug are to provide a disc with an extended library to include mathematical functions and also a stand-alone generator to allow developed programs to run on BBC's without the C ROMS fitted. I received a prerelease of this disc but without the full documentation.

The Beebug C system is far superior to that provided by Acorn as the above points indicate. The system commands also provide options of equivalent power for redirecting input and output files, using macros for conditional compilation and so on (albeit in non-UNIX like formats). It does not include its own text editor, however, so that you will need an 80 column wordprocessor or text editor (the Master 128 EDIT is ideal) but I cannot imagine that many C purchasers would lack a word processor. Another disadvantage is that the compiled code executes much slower than in the Acorn system in some types of application as we shall see later.

The stand alone generator is a big advantage, but it must be appreciated that this will not turn your file into machine code. What it actually does is to add a machine code interpreter onto your file so considerably increasing the length of the code and leaving execution time more or less unaffected. Perhaps the reason that Acorn are not attempting this is because their executable images are already so lengthy that stand-alone code would be just too long to fit into the machines memory. Even with Beebug's much more compact version, memory limits are going to be a problem with programs of any significant length.

The Beebug documentation is a well printed and produced though rather thinner than the Acorn version. It provides a similar approach to that of Acorn by specifying the language relative to the Kernighan and Ritchie standard and providing no tutorial content. It is rather friendlier in various respects, but less detailed in its description of standard functions. I found myself developing code in the Beebug environment for preference, but using the Acorn manual for information on standard routines!

Brasscourt C

The Brasscourt version is the one I looked at last - and least, for reasons that will become apparent. Unlike the other two, it is disc rather than ROM based. The disc is copyable (and transferable to ADFS) but the main routines will only work if a copyright protection plug is inserted in the user port (irritating should this port be in use).

It is the only one of the three versions which could lay claim to forming a substitute

for assembler as a system language in that it compiles into 6502 machine code (it also provides an alternative 6502 assembler to the one built into BASIC). Unfortunately, it is nothing like a standard implementation of C.

The documentation, unlike the Acorn and Beebug versions, does provide description of the intrinsic C language and claims to have implemented a full and standard version of this. However, there are virtually no library functions provided at all beyond a minimal subset of input/output routines such as printf and scanf - and I could not actually get these to work! A disc based text editor invoked by *EDT <filename> is provided and is adequate for producing source text files if you have no better alternative. Object files are produced by *CC <infile> <outfile>. In place of linking, there is then an assembly process where (apparently) *ASM followed by an appropriate file list will produce an executable machine code file. The file list always includes a standard file plus your object file plus optional extras depending upon your usage of floating point arithmetic and/or floating point conversions in the input/output routine.

I say "apparently" because I was unable to get even the simplest C programs of my own construction to work correctly. I tried it with the two simple programs shown in Listings 1A and 2A which I wrote to test the speed of integer and floating point arithmetic on the Acorn and Beebug implementations (see below) after deleting the header files which are not required, removing the unrecognised time function and so on. The first program compiled and assembled without error messages but crashed the machine when run. The second would not even com-

pile, objecting to the printf command even though I had followed the instructed file list for floating point routines. I suspect that the printf command was causing the system crash in the first case also. In the course of this unpleasant experience I discovered how poor the diagnostics on the system were. The compiler and assembler both produce error numbers. The former are documented so poorly as to be virtually useless and the latter are not documented at all!

I am not saying that the Brasscourt system will not compile and run C code of a sort. Several utilities written in Brasscourt C are provided on the disc along with source code using proper C control structures and data types. Incidentally, the utilities are for copying and backing up files, disc string searching, assembler code labelling and text file printing. I examined the source code provided for the utilities and found that none used the library I/O routines but provided instead their own functions built up from low level intrinsic functions such as putchar.

The failure to compile and run correctly my simple C routines implies either that there are bugs in the system (almost certainly in the printf implementation) or that the implementation is non-standard in hard to detect ways. Given that the lack of linked library functions makes this version ineligible for consideration as a C language for educational or portability purposes, the only function it could serve is as an alternative to assembly code for the development low level utilities of restricted function. This article is not, however, concerned with machine code utilities and I am afraid that I had neither the time nor the inclination to pursue this highly limited, poorly documented and possible bug

LISTING 1A

```
/* Program to compute prime numbers */
/* Written in Beebug C */
/* (time function not available in Acorn C) */

/* Jonathan Evans, October 1987 */

#include <h.stdio>
#include <h.stdlib>          /* for use of time function */

main()
{
    int maxno=1000, nfound=2, primes[300];
    int i, n, m, pfound;
    float t1, t2;
    time(&t1);
    printf("%8d",primes[1]=1);
    printf("%8d",primes[2]=2);
    for (n=3; n <= maxno; n+=2) /* for numbers from 2 to maxno, step 2 */
        if (m=1; pfound = 1; /* pfound is TRUE (non-zero) */
            do { m++; /* m = m+1 */
                if (!(n % primes[m])) pfound--;
                /* if n mod (primes[m]) is 0 then 'if' condition becomes
                 TRUE - is not (!) 0 (FALSE). Then pfound is decremented to 0
                 (FALSE) indicating that n is not prime */
            } while (pfound && (m < nfound));
    /* continue looping while pfound is TRUE and m is less than
     the total number of primes found to date */
    if (pfound) printf("%8d",primes[++nfound]=n);
    /* pfound can only be true if no previous prime was found
     to divide exactly into it. Then increment nfound before
     using it to index the next location of the array primes */
    }
    t2=time();
    printf("\n\nPrimes found %d up to %d\n", nfound, maxno);
    printf("Time taken %.2f seconds\n", (t2-t1)/100);
}
```


LISTING 1B

```

10 REM PROGRAM TO COMPUTE PRIME NUMBERS
20 REM Jonathan Evans, October 1987
30 :
40 DIM primes%(300)
50 maxno%=1000:nfound%=2:primes%(1)=1:primes%(2)=2
60 PRINT 1,2;
70 TIME=0
80 FOR N%=3 TO maxno% STEP 2
90   M%=1:pfound%=TRUE
100  REPEAT
110   M%=M%+1
120   IF N% MOD primes%(M%) = 0 THEN pfound% = FALSE
130   UNTIL NOT pfound% OR M%=nfound%
140   IF pfound% THEN nfound%=nfound%+1: primes%(nfound%)=N%;PRINT N%;
150 NEXT N%
160 T=TIME
170 PRINT "Primes found ";nfound%;" up to 1000"
180 PRINT "Time taken ";T/100;" seconds"
190 END

```

TABLE 2

Comparisons between programs written in BASIC and alternative C's
All test conducted on a standard Master 128 running under ADFS

(i) Speed comparisons (timings in seconds)

Function	Language	Compile & Link	Execute
Find primes nos up to 1000	BASIC	N/A	68.7
	Acorn C	116.6	21.3
	Beebug C	58.9	41.9
Convert degrees to radians (3600 times)	BASIC	N/A	27.0
	Acorn C	124.5	23.7
	Beebug C	50.8	22.9
Convert 100 words to lower case and sort alphabetically	BASIC	N/A	34.6
	Acorn C	185.0	20.8
	Beebug C	82.9	38.9
Print 10,000 characters to screen	BASIC	N/A	5.2
	Acorn C	111.5	12.3
	Beebug C	55.1	5.4

(ii) Code size comparisons in bytes

Wordsort programs (Listings 3a & 3b)

BASIC	1,201
Acorn C (stdlib)	11,518
Beebug C	3,371
Beebug C (stand alone)	10,490

Notes:

- (1) C file lengths are for files of compiled, executable code
- (2) Execution times and file lengths for Beebug C are for files linked with the NODEBUG option

stores the list of words in memory. C uses "white space" (blanks, tab characters and return characters) as separators which is quite handy. In C, strings are actually arrays of type **char** and would be horribly tedious to handle directly as each letter would have to be indexed separately. Consequently, a string array is better handled by declaring an array of pointers to strings. When accessed via a pointer the string as a whole is read up to a terminating null character allocated by the system. The program in Listing 3a actually dimensions an array of pointers – one for each word to be read. This does not, in itself, reserve storage for the strings, however. This could be done by a separate dimensioning of a two dimensional character array, but would be wasteful of memory as each row would have to reserve enough room for the longest possible word. A much more efficient method is provided by the system function **malloc** which allocates exactly the amount of storage requested and returns a pointer to it. This doesn't matter when the array is later sorted because the sort does not move the strings themselves about, it merely rearranges the addresses held in the pointer array.

Although this seems rather low level, there is a distinct advantage over BBC BASIC here which handles strings and their storage very inefficiently. First of all, BASIC allocates more bytes than are needed when placing strings in an array. Secondly, it creates considerable "garbage" in the form of temporary use of memory when handling strings which is never collected. This caused me severe memory problems when writing the Adventurescape system though admittedly I could probably have avoided some of this by using "static" strings (accessed by indirection via the \$ operator in a manner not unlike the pointers of C). Not only does C allow you to control exactly how much memory is allocated for strings in the most efficient possible manner, but you can even reclaim it by using the function "free" which reverses "malloc".

The BASIC version of this program (Listing 3b) is rather longer in actual code because BASIC does not have procedures for reading straight text files, so I had to write my own using BGET#; it also lacks the equivalent of other library functions in C such as "tolower" which converts text to lower case – again requiring me to do some tedious programming as in **FNmodword**.

The comparative speed data for BASIC and the two versions of C are shown in Table 2(i). Compilation and linkage time is roughly twice as slow in the Acorn version for all programs. In terms of execution speeds, on the integer arithmetic task both versions of C are considerably faster than BASIC. It should, however, be remembered that BASIC uses always long integers (4 bytes) whereas short (2 byte) integers were adequate for the task in C (note another potential source of saving memory where large arrays of integers are required). Acorn C is astonishingly fast on this task, running roughly twice

ridden package any further. Amazingly, the asking price is well above that of the two proper C's considered in this article.

Test programs

In order to help those with little or no experience of coding in C, I have provided detailed comments on the C listings and also provided listings of the equivalent BASIC programs that I wrote for speed comparisons. Listings 1a and 1b show C and BASIC versions of the program I wrote for testing speed of integer arithmetic – it computes and prints the prime numbers between 1 and 1000. As with all these examples, it doesn't matter whether the algorithm used is par-

ticularly efficient – it is the same for each language. Incidentally, owing to the lack of time function in the Acorn version I made each C program produce a beep at the start and end of the timing period and used an old fashioned stopwatch! The second program (Listings 2a and 2b) tests floating point arithmetic by converting degrees to radians at intervals of .1 of a degree. Only every hundredth computation is actually printed on the screen so that the timings represent mostly calculation speed and not screen access time.

The third program (Listings 3a and 3b) is the most complex. First of all, the program reads words from an ordinary text file and

LISTING 2a

```

/* Convert degrees to radians */
/* Floating point arithmetic test */

/* prints only every hundredth value computed so that time
   is mostly due to computation and not screen handling */

/* Jonathan Evans, October 1987 */

#include <h.stdio>
#define BEEP putchar(7) /* to provide timing points for stopwatch */
#define PI 3.141593

main()
{
    float degree, rad, radian(); /* type of functions called must be declared */
    int count=0; /* if they are to return non-integer value */
    BEEP;
    for (degree = .1; degree <= 360; degree += .1)
    {
        rad = radian(degree);
        if (++count == 100)
        {
            printf("%5.1f%10.3f\n", degree, rad);
            count = 0;
        }
    }
    BEEP;
}

float radian(d) /* declare type of function since non-integer */
float d; /* value (float) to be returned */
{
    return(d*PI/360);
}

```

LISTING 2b

```

10 REM Convert degrees to radians
20 :
30 count=0:TIME=0
40 FOR degree = 0.1 TO 360 STEP 0.1
50   radian=degree*2*PI/360
60   count=count+1
70   IF count=100 THEN PRINT degree,radian: count=0
80 NEXT degree
90 T=TIME
100 PRINT "Time = ";TIME/100;" seconds"

```

LISTING 3a

```

/* C program to read words from a file, convert to */
/* lower case and sort into alphabetical order */
/* Jonathan Evans, October 1987 */
/* insert preprocessor commands at top of file */

#include <h.stdio>
#include <h.string>
#include <h ctype>
#include <h.stdlib> /* Beebug version, for Acorn use #include <h.malloc> */

#define BEEP putchar(7)
#define NWORDS 100

/* declare global variables outside functions and before main */
char *wptrs [NWORDS+1]; /* dimension array of pointers for word list */

main()
{
    read_words ("WORDS");
    print_words ("INPUT WORDS");
    BEEP; /* start of timed period */
    conv_words();
    sort_words();
    BEEP; /* end of timed period */
    print_words ("SORTED WORDS");
}

read_words(fn)
/* open text file on the disc and read word list into memory */
char *fn; /* declare type of argument list variables after function
          /* name but before opening brace */
{
    char word[20]; /* create temporary storage for words read from file */
    char *malloc(); /* declare type of any functions returning non
                    integer values including library functions
                    such as malloc */
    int wn=1;
    FILE *fpointer;

```

as fast as Beebug C and three times quicker than BASIC. Surprisingly, the floating point task (Listings 2a,b) produced little difference between the three languages and Beebug was marginally faster here. However, it must be pointed out that both Acorn C and BASIC use a higher precision (5 bytes) for floating point numbers than does Beebug C (4 bytes). Incidentally, neither version of C supports true double precision arithmetic, instead converting any type statement of "double" to the standard "float".

The third task – timed for converting 100 words into lower case and sorting by the (intentionally) slow algorithm of a bubble sort once again found the Acorn C to be much quicker than BASIC, with Beebug C relegated to third place! I can only assume that Beebug C is less efficient in handling pointers which are extensively used in this particular program. The final task was one that I ran to check a hunch that Acorn C was slow in writing to the screen. As you can see, it takes more than twice as long as either BASIC or Beebug C – I have no idea why!

Table 2(ii) shows a comparison of the code size for the word sorting programs in the different languages, after compilation and linking in the case of the C programs. It is interesting that the BBC BASIC version is still shorter than the most compact of the C versions – that of Beebug running within its own environment. Both Acorn C and the stand alone version of the Beebug C programs are much longer due to fixed overheads of around 7 to 8K for the library and stand alone code respectively. Ambitious C programs – certainly involving graphics – are likely in these cases to run into memory problems unless used with a second processor or at least a shadow RAM machine.

Conclusions

One conclusion you might draw from this article is that the most powerful, versatile and efficient high level language in which to program the BBC micro is – and is likely to remain – BBC BASIC! This is largely true, due partly to the small memory of the machine making true compiled languages impossible to implement properly, and also due to the brilliance with which BBC BASIC is itself written. From other points of view – especially educational ones – exclusive use of BASIC is not desirable, however. It is not very portable, allows bad programming habits to flourish and is much less likely to be useful when moving to other, more powerful machines.

As to *which* C, the attentive reader is unlikely to be surprised by my recommendations. Brasscourt C is for assembler freaks who want to speed up development time on low level utility programming – assuming they don't object to the high asking price and low friendliness of the system. Acorn C provides a professional programming environment but is badly let down by its slow


```

fpinter = fopen(fn,"r"); /* open file for read access only */
for (wn=1; wn <= NWORDS; wn++)
{
    fscanf(fpinter,"%s",word); /*read strings delimited by spaces */
    wptrs[wn] = malloc(strlen(word)+1);
    /* reserve space on heap and set corresponding pointer */
    /* add 1 to strlen to allow for terminating null character */
    strcpy(wptrs[wn],word); /* copy word from temporary store */
}
fclose(fpinter);
}

print_words(mess)
/* print current state of word list headed with description */
char *mess;
{
    int wn;
    puts(mess);
    for (wn=1; wn <= NWORDS; wn++)
        printf("%d %s ",wn,wptrs[wn]);
    puts("\n\n");
}

conv_words()
/* convert word list to lower case letters */
{
    int i;
    puts("Converting words...\n\n");
    for (i=1; i <= NWORDS; i++)
        cv_word(wptrs[i]);
}

cv_word(ptr)
/* convert individual words passed from conv_words */
char *ptr;
{
    while (*ptr != NULL) /* null character indicates end of string */
        *ptr = tolower(*ptr++); /* convert character then increment pointer */
}

sort_words()
/* sort list into alphabetical order using bubble sort */
{
    char *temp;
    int wn, count=1;
    puts("Sorting words...\n\n");
    while (count > 0)
    {
        count = 0;
        for (wn=1; wn<NWORDS; wn++)
        {
            if (strcmp(wptrs[wn],wptrs[wn+1]) > 0)
            {
                temp = wptrs[wn]; /* swap pointers without actually */
                wptrs[wn] = wptrs[wn+1]; /* moving stored strings */
                wptrs[wn+1] = temp;
                count++;
            }
        }
    }
}

```

and inefficient method of compiling code, its lack of a mathematical function library and the difficulty of access to the BBC micro's graphics and operating system. Acorn must at least do something about the library deficiencies if they are not to be wiped out by the competition from Beebug. The Beebug C implementation is excellent in terms of standardisation, full provision of library functions that people are likely to need (with the additional disc) and speed and friendliness of use. The only question mark concerns the speed of execution of the compiled code which may not – on average – improve much on that of BBC BASIC. However, whether your interest in C is for education, portability or just preference over BASIC the Beebug version has to be the best buy.

Factfile

● Acorn C is available from dealers priced £89.70 including VAT. It is suitable for use with the B+, Master 128 or Compact machines or for any BBC fitted with a 6502 second or co-processor. Contact ☎ (0223) 214411

● Beebug C is available from Beebug Ltd, Dolphin Place, Holywell Hill, St Albans, AL1 1EX. The price for the basic system (2 ROMS plus disc, or 1 disc for the Compact) is £59. The disc containing stand alone generator and maths library is a further £19. The system runs on all 8 bit BBC Micros.

● Brasscourt C is available on disc, priced £85 + VAT, from Brasscourt Ltd, Oakford Farm, Marshfield, Chippenham, Wilts SN1 8AN. Specify model, drive types and DFS/ADFS when ordering.

```

10 REM Program to read words from file, convert to
20 REM lower case and sort into alphabetical order
30 REM
40 REM Jonathan Evans, October 1987
50 REM
60 PROCreadwords
70 PROCprint_words("INPUT WORDS")
80 T=TIME
90 PROCconv_words
100 PROCsort_words
110 PRINT "Time taken = ";(TIME-T)/100;" seconds"
120 PROCprint_words("SORTED WORDS")
130 END
140 :
150 DEFPROCreadwords
160 F=OPENIN("C.WORDS")
170 nwords=100
180 DIM words$(nwords)
190 FOR I%=1 TO 100
200 words$(I%)=FNreadword
210 NEXT I%
220 CLOSE#F
230 ENDPROC
240 :
250 DEFNreadword
260 W$=""
270 REPEAT
280 C$=CHR$(BGET#F)
290 IF C$<>" " THEN W$=W$+C$
300 UNTIL C$=" "
310 W$=W$
320 :
330 DEFPROCprint_words(M$)
340 PRINT M$
350 FOR J%=1 TO nwords
360 PRINT ;J%;" ";words$(J%); " ";
370 NEXT J%
380 PRINT""
390 ENDPROC
400 :
410 DEFPROCconv_words
420 PRINT "Converting words"
430 FOR I%=1 TO nwords
440 E%=LEN(words$(I%))
450 FOR J%=1 TO E%
460 W$=words$(I%)
470 L$=MID$(W$,J%,1) : L%=ASC(L$)
480 IF L% < 97 THEN words$(I%)=FNmodword(W$,L%)
490 NEXT J%
500 NEXT I%
510 ENDPROC
520 :
530 DEFNmodword(W$,L%)
540 LOCAL L$
550 L$=CHR$(L%+32)
560 IF J%=1 THEN = L$ + RIGHT$(W$,E%-1)
570 IF J%=E% THEN = LEFT$(W$,E%-1) + L$
580 = LEFT$(W$,J%-1)+L$+RIGHT$(W$,E%-J%)
590 :
600 DEFPROCsort_words
610 PRINT "Sorting words"
620 REPEAT
630 C%=0
640 FOR J%=1 TO nwords-1
650 IF words$(J%) > words$(J%+1) THEN PROCswap:C%=C%+1
660 NEXT J%
670 UNTIL C%=0
680 ENDPROC
690 :
700 DEFPROCswap
710 T$=words$(J%):words$(J%)=words$(J%+1):words$(J%+1)=T$
720 ENDPROC

```


Beebug C

Beebug C is a full implementation of the language C conforming to, and extending beyond the Kernighan and Ritchie standard. Beebug C produces fast compact code and supports floating point maths. A comprehensive set of library functions and macros is supplied on disc.

Features

- Runs on a standard 32K BBC model B, B+, Master 128 or Master Compact
- 40/80 Track DFS, ADFS and Tube compatible
- Support for Acorn operating system
- Powerful command line interpreter with over 20 commands & qualifiers
- Expandable run-time library on disc containing nearly 100 functions & macros
- Full macro-handling facilities
- Debugging facilities and helpful error messages
- C programs may be written using almost any text editor or word-processor such as View, Wordwise, InterWord etc.

Beebug C is supplied on 2 ROMs and a 40 or 80 track disc. A 3.5" Compact version is also available

price
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inc VAT

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Beebug C site licences available for educational establishments.

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USER

is written by an experienced team of Archimedes enthusiasts with roots in education, home computing, and over 5 years experience with the BBC Model B and Master computers with the BEEBUG magazine. It is published 10 times a year and is only available on subscription, not in the shops.

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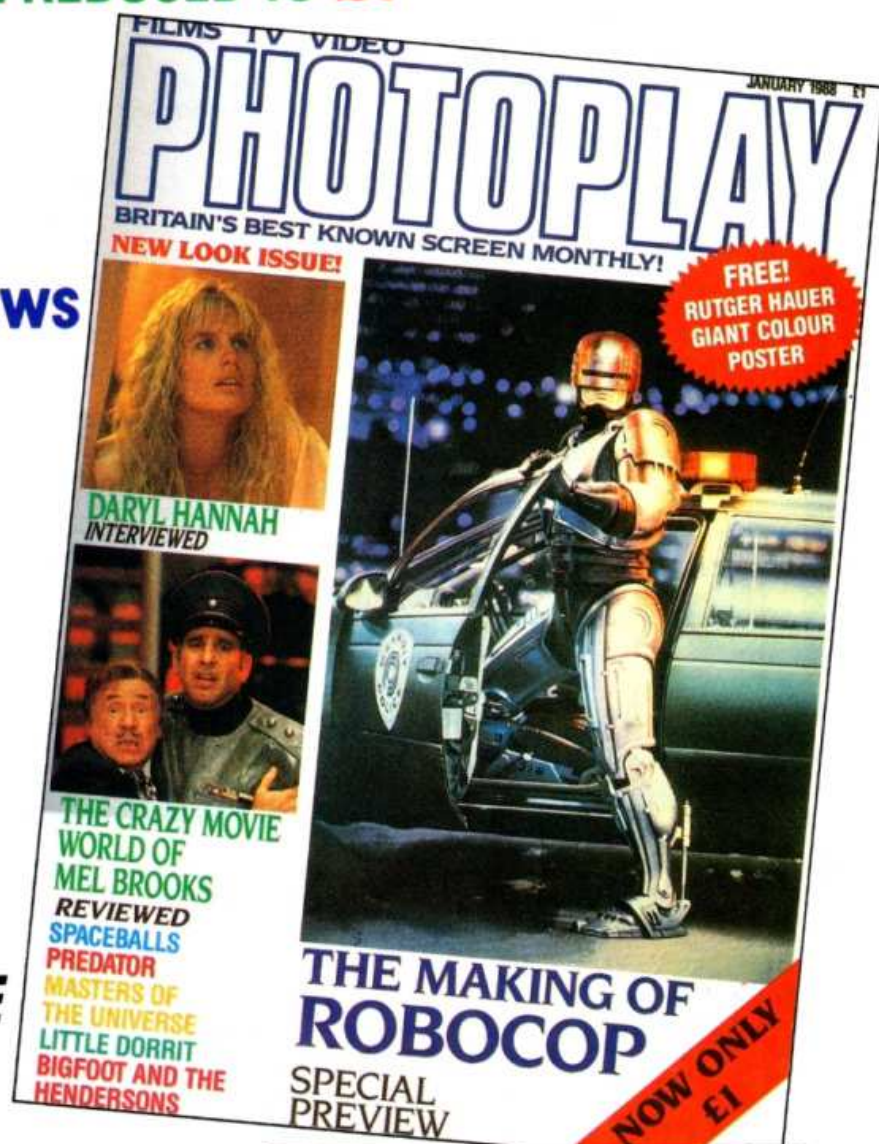
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C O N T E N T S

Archimedes – the A in A&B Computing

Archimedes Report

Gordon Taylor assesses **ArcWriter**, the free Acornsoft wordprocessor, benchtests the **Archimedes A440** with **hard disc**, and partitions it for MSDOS before investigating Acornsoft **Fortran**

Red Keys

Includes music publishing with Archimedes and laser printer and full Archimedes news roundup

Dancing on a High Wire

Transferring software from BBC Micro to Archimedes the easy way

Archieball

Arcade quality game in the style of recent hit programs Impact and Arkenoid

With a micro as original and exciting as Archimedes you are going to need a magazine which brings you factual information in full. Archimedes Computing in A&B is dedicated to the 300 and 400 series RISC based Acorn micros so watch out for our monthly coverage.



RED KEYS



Arctist

Fairhurst Instruments have been quick off the mark with the release of drawing package Arctist, priced at £19.95. Arctist comes on one 3.5" disc and has some nice features such as copy area, zoom, rays, fill, circle, flip up-down and right-left and inverse. We will take a further look next month in Red Keys. Details ☎ 0625 525694



Archie on the airwaves; Micronet kick-off their coverage.

Archimedes up on Prestel

For ARM enthusiasts; information about the generic Acorn RISC processor (including the one in the Archimedes) is now up on Prestel, there is comment, feedback, questions and answers – see Prestel page 800 and follow the signs.

Archimedes – new price structure (excluding VAT)

Archimedes 305 £699 with mono monitor £749 with colour monitor £889

Archimedes 310 £775 with mono monitor £825 with colour monitor £975

Archimedes 310M £835 with mono monitor £885 with colour monitor £1035

The 400 series starts at (figures include VAT) £1608.85 and pushes up to £2873.85 for the top of the range 4Mb RAM with colour monitor and 20Mb hard disk.

Econet module £49.99 0.5Mb

RAM upgrade £102.35 Floppy disk (3.5") £143.75 20Mb hard disk and Podule £573.85 Podule backplane £40.25 A Series (confusing isn't it, all these different titles) manual £19.95

ROM Podule and I/O Podule prices to be announced. These are designed to bring Archimedes up to the BBC Micro specification!!!

A MIDI interface to add on to the I/O module will be available, price unknown

MS-DOS 10Mhz 80186 co-processor unit, availability/price unknown

Third party podule releases are known to include modem, IEEE, video frame grabber and high performance A to D interface

Using the *SET Alias\$ Command

"*SET Alias\$" can be used to generate new *commands out of existing ones or to rename an existing command.

To set up a *MODE <n> command is now easy with this command ie

***SET Alias\$MODE ECHO**
| <22> | <%0>

Which does a *ECHO <22><n> whenever *MODE n is used.

NOTE: If you use an ECHO command with a *SET command place a '|' (bar) before the '<' or the command line interpreter will

try and convert it to an ASCII character.

The %0 is a variable input after the new command ie the 'n'. There may be up to ten variable from %0 to %9 each can be used as many times as necessary in the Alias command. The '<' and '>' are only necessary for the *ECHO command as this changes the number between them into that ASCII character.

To alter the names of an existing command is also easy ie

To change *FORMAT to *FORM use:

***SET Alias\$FORM FORMAT**
%0 %1

Archimedes Display

18 display modes

European standard rate (non interlaced) text graphics resolution

number of colours
20x32 160x256 4,16,256 40x32
320x256 2,4,16,256 80x32 640x

256 2,4,16,256 132x32 text only
16 40x25 text only 2 40x25
Teletext 16 80x25 text only 2,4,16
132x25 text only 16

High scan rate (for use with monitors such as NEC multisync)

3 screen modes
text graphics resolution number of
colours

80x64 640x512 2,4,16

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The board accepts software such as the Archimedes versions of Inter-Word, Inter-Chart and Inter-Sheet and will accept the forthcoming document processor and drawing programs. It is compatible and fully obeys all Acorn podule standards. It requires the back-plane to be installed—available from us and Acorn stockists.

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£59.00 + VAT (£67.85) with battery
and controller chip



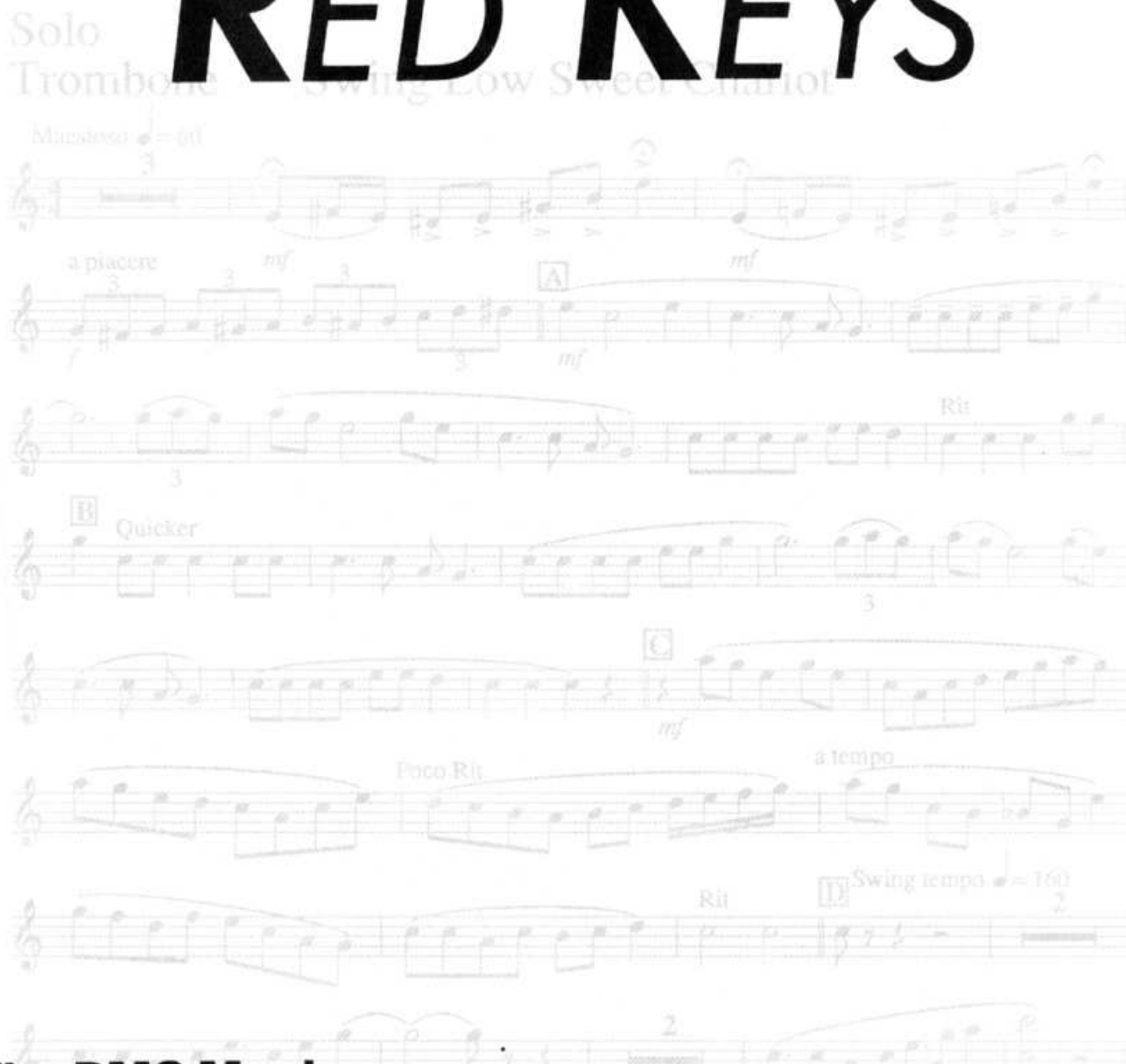
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RED KEYS



The PMS Music Typesetter

There are lots of excellent wordprocessors available for the BBC Micro and whatever your application, be it letters, reports, scientific papers or a 1000 page novel you will be able to find one – possibly several – to suit your needs.

If you want to produce a printed music score, however, you have a very limited number of options. Most methods of notating and printing music are time-consuming and a lot of the work needs to be done by hand. There are very few systems which use a computer (BBC or otherwise) and those which do are limited and often unsatisfactory. Computers may be able to help us process words but they appear to be nowhere near helping us process music notation. Until now.

Philip Hazel, a software developer at the University of Cambridge and a keen musician,

has developed a program to help the musician produce quality copies of printed music. His system is simply called The PMS Music Typesetter, PMS standing for 'Philip's Music System'.

It began life as a program on a Beeb with attached 32016 2nd Processor and it has now been transferred to the Archimedes. It is written in BCPL and the current version contains over 120K of compiled code.

The superb results are produced with the aid of an Apple LaserWriter which has a resolution of 300 dots per inch. Great use is made of the LaserWriter's built-in PostScript page description language so unfortunately operation with a dot matrix printer is impossible. The program will work, however, with any page printer which supports the PostScript language.

Notation is entered into PMS in Philip's own MCL (Music Composition Language), a method he claims is far quicker and easier than entering notes on a staff. It was

designed to be easy for a musician to remember and makes use of as many familiar music notations as possible within the confines of the computer's character set. Here are the first six bars of the National Anthem:

Key G Time 3/4 [Staff 1] [treble] g g a f. g-a b b c' b. a- g a g f G. [endstaff]

It is possible to direct the output to the screen rather than the printer. As the screen has nowhere near the resolution of 300 dpi the presentation is somewhat rough; slurs, for example, are represented as straight lines. This is a limitation of the computer's graphics, not the program but it is still a useful aid to spotting errors.

The program supports all combinations of notes, rests and accidentals with durations ranging from the breve to the hemi-demi-semiquaver. It will print expressions such as staccato and accents and ornaments such as mordents and trills. It has a full complement of bar lines, repeat markers, ties and slurs and it allows you to print words beneath the

music, too.

It can handle up to 32 staves simultaneously and each staff may have up to 500 bars of music (although it is possible to increase this). One of its limitations – at the moment – is its inability to print more than one line of music per staff although in some circumstances it is possible to achieve the effect of two (or more) lines on a staff by overprinting. This doesn't affect the print quality at all.

Field trials

The complete language of traditional music notation is very large indeed and even though PMS is fully operational it is also in a state of continuous development. It is undergoing field trials by various musicians, students and educational establishments and new features are simply added as they are requested. A recent addition, for example, was the inclusion of medieval music notation.

News of PMS has spread quite rapidly by word of mouth and although the hardware required to run the system limits the number of potential users, it has found its way into many colleges and universities. The Apple LaserWriter costs around £3000 but as hardware prices (hopefully) fall and page printers come down in price PMS may find itself an even bigger market. It is currently being transported to an IBM mainframe.

Meanwhile, Philip is quite happy to continue developing PMS according to his users' requests. He has recently written the rudiments of a program (in C) to take the output from the Archimedes' music editor and convert it into input for PMS. He did it basically to see if he could decode the files – and he can – although such things as ornaments and text input would have to be added in PMS which, Philip feels, limits the usefulness of the operation.

Although some musicians may feel happier using a staff editor for music entry, the difficulties in incorporating all PMS's features in such an editor make the development of one unlikely. Philip said, however, that he would certainly consider it if the demand was there.

It's quite evident that a regular user can produce perfect notation with PMS very quickly indeed. If there are errors they can be corrected easily without having to scrape off music letraset or rewrite a whole page of music. You simply edit it in the computer.

As Philip still considers the program to be under development he hasn't contacted any music publishers to sound out their reaction. A publisher would seem to be the perfect home for PMS, especially as any special features they require could easily be incorporated. Perhaps one or two will get in touch with him.

More details are available from Philip Hazel, 33 Metcalfe Road, Cambridge, CB4 2DB. Tel: 0223 34714 (work) and 0223 65518 (home).

Having all of us suffered the effects of incompatibility you will appreciate that the following is written in the true spirit of the computer user with a sense of humour.

Datapost arrived with two large heavy boxes weighting in total 25 kilos. Carefully unpacked, breath held, fingers crossed, leads fixed, main switch on. Breathe again, indicator lights on and that welcome 'hello' bleep. Certainly a different bleep to my old beloved friends the BBC B and Master and oh how different it looks. Is it really from the same stable?

Mmm she looks good but what's this? A QWERTY keyboard? Second row AGKFLJKHS— in that order. Press 'G' ah ha 'S' on the screen. At least the keys are actually in the right order it is just that the keys are not what they say they are which is something but, nevertheless, a bit off-putting, except, of course, to a touch typist. Incidentally, the raised markers on keys 'F' and 'J', presumably for a touch typist or blind operator, are a nice touch!

The problem of a 'double dutch' keyboard can easily be overcome by gently and evenly prising the key taps off with a pair of screwdrivers and putting them back in the correct order ASDFGFJHJKL—. Pretend you are playing scrabble.

Second problem encountered, cursor arrow key to the right when pressed stuck and so did various other keys. This problem is overcome by carefully unscrewing the keyboard, gently lifting off the cover, and then with a nail file filing the rough edges off the cuts outs of the moulding round the keys.

Eureka! I now have a working Archimedes with a QWERTY keyboard and keys that do not stick.

The Welcome Disk in, I am off. What fantastic graphics, it is a pity the Welcome Guide did not include a short paragraph on the game. The rest of the disk explored, all very impressive — one is left feeling that it is even better than expected. Eureka!

Now to get down to more serious matters. How do I access the basic screen editor? The Manual, page 401, is quite explicit, 'Type EDIT and return'. Reply 'Bad command'. I tried all the variations on a theme *EDIT, ED, etc. etc. all without success.

A phone call to the supplier, who likewise is reading his manual. In reply to my question said 'Type EDIT and return'. 'Try it' said I. 'Bad command' says he. 'Eureka' your Archimedes is like mine said I. 'I'll phone Acorn and ring you back' says he. So presuming my Archimedes and the one in the South of England are not unique, if you want to access the basic screen editor this is what you do:

Put the Welcome Disk in the disk drive

Type QUIT then press the return key

Type *RMLOAD \$.MODULES.ARTHUR then press the return key

Type *BASIC then press the return key

Type EDIT then press the return key.

Another problem encountered is how to load the modules. This is the easy way to do this:

Ensure the Welcome Disk is in the disk drive.

Type QUIT and then press the return key

Type *RMLOAD \$.MODULES.(the module name, i.e. 65ARTHUR) and then press the return key

Type *BASIC and then press the return key.

Having had the Archimedes for all of three days this is as far as I have got, but I hope your readers who are lucky enough to have an Archimedes will be able to shout Eureka immediately.

Yours truly,

R. K. Waterworth

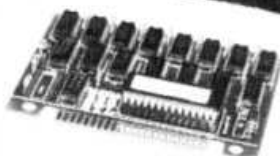
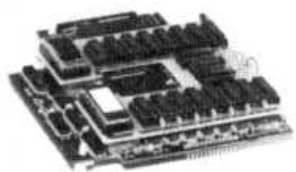
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The PC-500 is the Acorn 80186 internal co-processor for the MASTER adapted by Solidisk with an appropriate lead for use on the BEEB (and the Master).

It has a mouse, 512K of RAM, 10MHz — 16 bit CPU (around 3 times the speed of the normal PC), 4 software discs containing the Digital GEM operating system, a wordprocessor, a painting program, CPM emulator and other utilities.

Price: **£239 inclusive**. Your BEEB must have a WD-1770 and ADFS.

Data sheet available on request.

THE PC-PLUS:

The PC-PLUS is an expanded PC-500, with one Megabyte of RAM instead of 512K. The extra memory allows large applications such as Desk Top Publishing (eg Fleet Street Editor) to be used on the BEEB or the MASTER.

The PC-PLUS is supplied with the same accessories as the PC-500 including the mouse and 4 discs. Price **£339 inc.**

Upgrade from an existing Acorn 80186 costs **£119.00** but you will be required to sign a service agreement. Please ring for details.

Data sheet available on request.

MASTER MEGA CARD:

The MEGA CARD (256K) plugs into a cartridge slot on the MASTER and adds instantly 256K of RAM. The card can be used as RAMDISK, printer buffer or sideways RAM. Price **£100.00 inc.**

Data sheet available on request.

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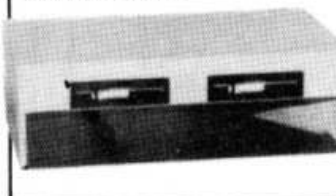


DOUBLE-SIDED 5 1/4" DISC DRIVE

This is a superb 80 track, double-sided, dual density, lever type and very fast disc drive. Unformatted capacity: one Megabyte. 40/80 track manual switch optional as most Acorn and Solidisk DFS have software switch. Supplied with data and power lead (please specify your computer). Price **£119.00 inc VAT**. 40/80 track manual switch if required: **£2.00 inc VAT**. Separate PSU if required: **£25.00 inc VAT**.

TWIN DOUBLE-SIDED 5 1/4" DISC DRIVES

Complete with bridge unit, suitable for both BBC and Master 128K. Price **£238.00 inc VAT**.



WD-1770 DFS:

The new Acorn Disc Filing Systems DFS and ADFS require both the WD-1770 chip. Solidisk offers two basic WD-1770 models which are totally compatible with the Acorn DFS/ADFS ROMs. We also offer our own DFS 2.2 and ADFS 2.1 ROMs which have a superset of utilities and commands. Data sheets on these ROMs are available on request.

1) WD-1770 DUAL DENSITY DISC INTERFACE for previously tape based BEEB. This is the standard Acorn disc upgrade since 1985. Prices are:

WD-1770 DDFS without DFS ROM **£35.00 inc.**

WD-1770 DDFS with DFS 2.2 ROM **£45.00 inc.**

WD-1770 DDFS with ADFS 2.1 ROM set **£55.00 inc.**

Data sheet available on request.

2) WD-1770+8271 (DFDC) DISC INTERFACE: for BEEB already equipped with the 8271. This system allows you to keep the existing 8271 disc interface while adding the new WD-1770 chip. It has a simple switch to allow changing between the 8271 and the WD-1770. To operate the hardware, you will need either the latest ROMs from Acorn (8271 DNFS 1.2, 1770 DNFS and 1770 ADFS) or Solidisk ROMs. If you are stuck with old or inappropriate DFS software, buy the inexpensive DFS 2.2 ROM. Prices are:

DFDC without DFS ROM **£45.00 inc.**

DFDC with DFS 2.2 ROM **£50.00 inc.**

DFDC with ADFS 2.1 ROM set **£55.00 inc.**

DFDC with 2.2 and 2.1 set (3 ROMs) **£63.00 inc.**

Data sheet available on request.

TWOMEG 128K: Number One Best Seller!

The new style TWOMEG 128K add-on board for the BBC is the closest emulation of the Master 128K ever achieved. It combines Sideways RAM, Shadow RAM and four extra Eprom sockets (4 on the BBC motherboard) in a single product. It is unobtrusive and easy to fit, just drop in and go!

It's the ideal upgrade for all Beebs, with more ROM sockets and even bigger memory than the Master! Compatible with Computer Concepts InterWord, Sheet and Spellmaster, Acorn View 3.1, ViewSheet, ViewStore and Basic, it is supplied with a quantity of useful software on five discs, eg database, spelling checker, macro basic, Ramdisk for STL DFS and ADFS etc.

A clever switch write-protects only the 8 banks of Sideways RAM, without affecting the Shadow RAM. Price: ex VAT: **£52.17**, inc VAT **£60.00**

FOURMEG 256K:

256K RAM (shadow and/or Sideways) 4 extra H/C ROM sockets on board (4 on BBC motherboard), 4MHz switchable CMOS 65C02 cpu, 32K Manager ROM. Price **£110.00 inc VAT**.

TWOMEG 256K:

256K RAM (shadow and/or Sideways) 4 extra H/C ROM sockets on board (4 on BBC motherboard), 2MHz CMOS 65C02 cpu, 32K Manager ROM.

Special Offer on InterWord and Wordwise Plus when purchased with any TWOMEG or FOURMEG board.

Wordwise Plus: **£30.00 inc VAT**
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gives your Beeb time, date and configure facilities similar to the Master. Price **£29.00 inc VAT**.

SWR32: 32K Sideways RAM, base unit and disc. Price **£20.00 inc VAT**. SWR 64: 64K Sideways RAM, 2 H/C ROM sockets on board, base unit and disc. Price **£30.00 inc VAT**.

EPROM PROGRAMMER:

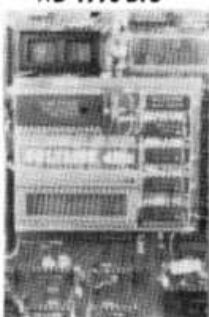
The UVIPROM is the cheapest Eprom programmer on the market, yet the easiest to use. UVIPROM for programming 2764 and 27128 (21V): **£20 UVIPROM-32** for programming 27256 (12.5V): **£20 inc VAT**. MULTIPROM, the deluxe version, programs most types of Eproms and fitted with TEXTOL ZIP socket, Price **£44.50 inc VAT**. The UVIPAC (Eprom Eraser) can erase any 3 Eproms in approximately 15 minutes, Price **£20.00 inc VAT**.

MASTERPLAN:

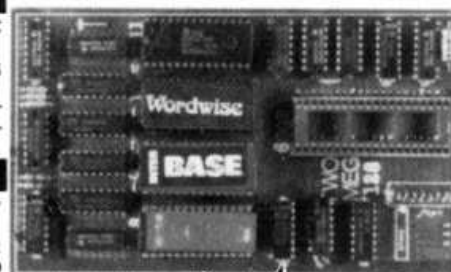
If you are thinking of exchanging your BEEB for a MASTER or an ARCHIMEDES, Solidisk MASTERPLAN is for you. We can quote immediately over the phone the buy-back value of your BEEB and the balance on your new system. So please give us a try!



WD-1770 DFS



1770 + 8271



TWO MEG 128

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ARCHIMEDES Computers

A305 PLUS, 1 Megabyte of RAM: £731 + VAT

v A305 upgraded to 1 MB, same as 310
v with Acorn colour monitor: £913.50 + VAT
v with Philips colour monitor: £930 + VAT

Please note:

Many packages such as Acorn Arc-Writer or Logistix leave little room on the program disc so that a second drive is very useful. Unless you plan to get the 20MB Winchester, our external drives (eg FD35A) are good and low cost. If you are going to use the MS-DOS Emulator, we recommend our FD525A, 40/80 track switchable because most PC software is still supplied on 5 1/4" format. For 100% media compatibility, you will need a 40-track double sided 5 1/4" drive, such as our PC525 (see below).
The way the new Arc software is going, everyone will sooner or later send to upgrade the memory to 4 Megabytes (and even beyond). If you can't afford an A440 now, you can trade-up from your 305 Plus. We will normally allow you 85%-95% of our invoice value.

ACORN ADD-ONS:

20 MB Hard Disc (AKD52)	normal
2-slot Podule Backplane (AKA01)	£499.00
ROM Podule (AKA05)	£39.00
I/O Podule (AKA10)	£39.00
MIDI add-on to I/O Podule (AKA15)	£79.00
	£29.00

Please add VAT to the above prices.

SOLIDISK ADD-ONS:

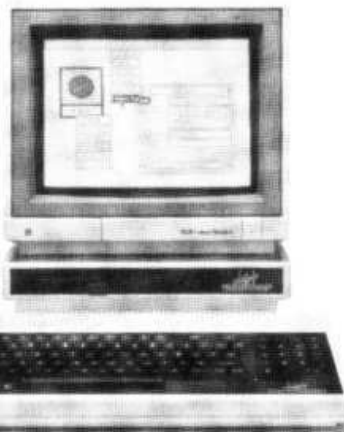
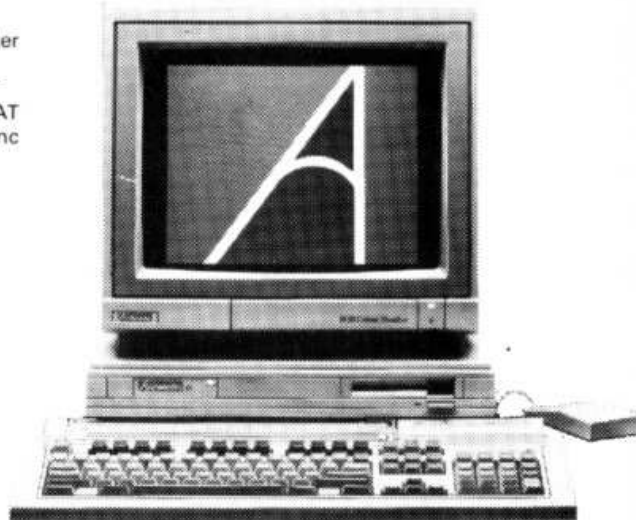
3 1/2" second drive (FD35A, external)	£100.00
5 1/4" second drive (FD525A, external)	£110.00
ARC-SAVER (released soon)	£49.00
(4-slot podule backplane with Thermi-fan)	
Dual user port podule short:	£13.00
Dual user port podule long:	£16.00
Eprom Programmer to be used with our Dual for 27C128	£18.00
Multi-Prommer for all types:	£39.13
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Teletext and TV adapter:	£87.00
Image-Master (video digitiser):	£52.17
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Please add VAT to the above prices.

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6% DISCOUNT

BEST DEALS



COMPACT 128K:

	Without monitor	Acorn monochrome	Acorn colour
	ex VAT	ex VAT	ex VAT
Compact 128K:	347.80	399.97	521.00
Compact 128K, CDFS ROM and a second disc drive:	434.00	499.10	608.70
A = twin 3 1/2" drives, B = 5 1/4" drives, C = one 3 1/2" and one 5 1/4"		478.00	549.70
Twin drives are usually required for disc copying, the Solidisk CDFS complements the Acorn ADFS with a superset of DFS commands and utilities such as single and double density, copying DFS discs to ADFS discs etc.			699.99

MASTER 128K:

	Without monitor	Philips monochrome	Philips colour
	ex VAT	ex VAT	ex VAT
Master 128K:	391.00	449.65	574.00
Master 128K with Twin disc drives:	556.50	639.97	730.25
The MASTER 128K comes bundled with Wordprocessor (View), spreadsheet (ViewSheet), Terminal software, DFS and ADFS. The monochrome monitor is 12", can be with green (BM7022) or amber (BM7522) phosphor, the colour monitor is 14" CM8833 with all imaginable inputs! (The Acorn colour monitor is a badged version of the latter.)		635.00	730.43
PLEASE NOTE: generous TRADE-IN allowances are available for upgrading your present system. Please call for immediate quotation.			839.99



TELETEXT AND TV ADAPTER

This unit includes a programmable TV tuner, a teletext adapter and a mains power supply unit. It has one input for the aerial and two output sockets. One socket is for connection to the computer and the other for composite video and sound, for connection to a suitable monitor such as the Philips CM8833. It is supplied with software on disc for any of the following computers: BBC model B, Master, Compact, Arc, ST and Amstrad PC. Unlike the ATS ROM (Morley version) with which it is fully compatible, it can download software for any other computer than the BBC. It can be used as a conventional TV tuner, except that channel selection is done by software and the details saved to disc (so that you can watch football at work!). Price: £99 inc. VAT (please specify computer and disc format).

IMAGE-MASTER:

This cost-effective video digitiser converts directly composite TV signal (camera, VTR, teletext adapter etc) to computer display. Image-Master resolution: 640 x 256 by 16 colours or shades but the computer display resolution is limited by your computer. Available for Arc, BBC, Master, Compact, ST and Amstrad PC. Price: from £60 inc. VAT (Please specify your computer, Arc model requires our user port podule). There are one input (composite video in) and two outputs (video out and to computer), 3 knobs (brightness, contrast and aspect ratio). The unit should be used with a suitable monitor such as the Philips CM 8833.

ADVANCED IMAGE-MASTER:

This digitiser can not only convert video signal into computer data, it can be used as a super colour display for the computer and replaces a GENLOCK device for picture over picture. It is capable of 4096 colours, 640x256 pixels and output for recording onto video tape or RGB (analog) monitor. There are two inputs (computer display in and camera) and 3 outputs (VTR out, Analog RGB out and computer data). Available initially (JAN 1988) for Arc and ST. Price £180 inc. VAT. Data sheets are available on request.

DTP SYSTEM INC. LASER PRINTER: £2499 + VAT!

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All items can be ordered by post, sending the coupon below and enclosing cheques, POs, drafts or credit card numbers or by phone. P and P is charged as follows:
Less than 1 KG (eg software, cartridges and books): £2.00
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Timeout

Dear Sirs,

Here are some more hints and tips for Archimedes users. They cover setting *TIME's output format. Using the the Alias\$ command and a list of some of the Archimedes system calls.

I would also like to point out that version 0.02 of the ADFS on the Archimedes has a bug in it where it cannot perform a *BACKUP or *COPY on a one drive system. There is a new version of the ADFS supplied on the Welcome disc and this has the problem fixed.

ZARCH users might like to

look out for the SHARK, it is normally located just out to sea but it moves around a lot. Shooting it gains a lot of points (around 1000) but it does spray a lot of virus into the air when shot. Thanks Superior and David Braben for a wonderful game.

Also if any of the people at ACORN are reading this (if published) then is it possible for there to be an extra option on the 'FILE' menu of the Desktop to allow the file details to be displayed ie. Name, Type, time and date created, Size and an option to lock and unlock the file.

Thanks for a great magazine and I look forward to other hints and tips from other users.

Archimedes software

A&B Computing Software Sale's first releases for the Archimedes are Adventurescape, Global View and Easyfont, all running in Archimedes native mode and taking full advantage of new screen Modes and vast increases in speed. These upgrades from some of our most popular software will be followed by brand new programs for 1988. So watch the Red Keys column for announcements.

Upgrades for existing Software Sale customers are available. Just send in your original disc as proof of purchase and a new 3.5" Archimedes version will be supplied.

Archimedes Adventurescape price

£15.00 Order product number DB86 Upgrade price £5.00 Order product number DB87

Archimedes Global View price
£10.00 Order product number DB88 Upgrade price £5.00 Order product number DB89

Archimedes Easyfont price
£10.00

Order product number DB90 Upgrade price £5.00 Order product number DB91

If you wish to order Archimedes software, turn to the Software Sale pages and fill in the order form with the appropriate product number and price.

Price changes/MSDOS bundle

Finalising their manufacturing plans has allowed Acorn to reduce the price of the 300 series by £100. The series now includes the 310M option.

Setting the *TIME' format

*TIME's output format can be changed via a "SET Sys\$DateFormat" command. The following are a list of valid parameters and result they will return.

%am Display 'am' or 'pm' depending on time
%pm Display 'am' or 'pm' depending on time
%ce Current century
%cs Hundredths of a second
%dn Day number (001=1st January)
%dy Day of the month
%mi Minutes
%mn Month number
%mo Current month (ie 'January')
%se Seconds
%st Day of the Month trailer (ie 'st', 'nd', 'rd')
%we Week day (ie Wednesday)
%wk Week number (since start of year)
%wn Week day number (1=Sunday ... 7=Saturday)

ARCHIMEDES SYS call String (MOS 0.20)

OS_WriteC
OS_WriteS
OS_Write0
OS_NewLine
OS_ReadC
OS_CLI
OS_Byte
OS_Word
OS_File
OS_Args
OS_BGet
OS_BPut
OS_GBPB
OS_Find
OS_ReadLine
OS_Control
OS_GetEnv
OS_Exit
OS_SetEnv
OS_IntOn
OS_IntOff
OS_CallBack
OS_EnterOS
OS_BreakPt
OS_BreakCtrl
OS_UnusedSWI
OS_UpdateMEMC
OS_SetCallBack
OS_Mouse
OS_Heap
OS_Module
OS_Claim
OS_Release
OS_ReadUnsigned
OS_GenerateEvent
OS_ReadVarVal
OS_SetVarVal
OS_GSInit
OS_GSRead

OS_GSTrans
OS_BinaryToDecimal
OS_FSControl
OS_ChangeDynamicArea
OS_GenerateError
OS_ReadEscapeState
OS_EvaluateExpression
OS_SpriteOp
OS_ReadPalette
OS_ServiceCall
OS_ReadVduVariables
OS_ReadPoint
OS_UpCall
OS_CallAVector
OS_ReadModeVariable
OS_RemoveCursors
OS_RestoreCursors
OS_SWINumberToString
OS_SWINumberFromString
OS_ValidateAddress
OS_CallAfter
OS_CallEvery
OS_RemoveTickerEvent
OS_InstallKeyHandler
OS_CheckModeValue
OS_ChangeEnvironment
OS_ClaimScreenMemory
OS_ReadMonotonicTime

These are used from BASIC with the SYS command ie

SYS "OS_Byte",5,1

will perform a "FX 5,1".

Nearly all of these will require extra parameters and it may be possible to return the result with the 'TO' option ie

SYS "OS_Find",&40,"!Boot" TO File%

would open '!Boot' for input and the file handler put in File%.

Yours faithfully
Paul Bedford
Peterborough

%yr Current Year (ie 87)
%12 Hours (in 12 hour clock)
%24 Hours (in 24 hour clock)
NOTE: Both %mo and %we may be told only to print the first three characters of their string by using %m3 and %w3 instead.
NOTE: This does not alter the format of the variable TIMES\$ in BASIC V only *TIME's format.

If the date is changed on the system the correct weekday is automatically calculated so no errors occur.

All the above parameters may

be used to set up the format of *TIME with other characters except '%', ie

***SET Sys\$DateFormat %w3,%dy,%m3,%ce%yr.%24,%mi:%se**

which is the default setting.

***SET Sys\$DateFormat Date=%DY/%MN/%YR. Time=%12:%MI:%SE.%CS%AM**

would produce a format of:

Date=07/10/87.

Time=08:04:05.14pm

Either upper or lower case may be used for the parameter names.

128K
ROM

MEGA-3

MEGA-3 ROM

A single 128K ROM containing INTER-WORD, INTER-SHEET and INTER-CHART. The package contains all manuals, keystrips and quick reference cards supplied with the individual packages, but the software is *all* on one chip, occupying just one ROM socket.

MEGA-3 ROM is compatible with the entire range of BBC Micros: Model-B, B+, B+128, Master and Compact.

Upgrades: Existing owners may optionally trade-in their INTER-WORD, INTER-SHEET or INTER-CHART for a discount of 25% each. This means that existing owners of all three may obtain a trade-in discount of 75%—a cost of just £21.25 + VAT (£24.44 incl.).

Price: full package £85.00 + VAT (£97.75 incl.).



Computer Concepts Ltd

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ARCHIMEDES REPORT

I have managed to get my hands on a 440, and am very favourably impressed. The additional memory and the Winchester can benefit both the PC Emulator, and applications – such as Logistix – which run in “native” mode. All registered owners of Arcs are entitled to a free copy of ArcWriter, which is quite a powerful word processor, as well as an excellent demonstration of the capabilities of the machine. Scientific and technical users will be glad to know that Acornsoft Fortran 77 (now in the release version) runs well on the 310, 410, and 440, and is highly competitive when compared with rivals running under MS-DOS.

The Archimedes 440

Regular readers will recall that the Archimedes range consists of the 300 Series, badged as BBC Microcomputers, and the 400 Series, which carry the Acorn name. The two Series are closely related, having the same four major Acorn-designed chips, but the 400 Series has even more potential for expansion. Production of the 400 Series started only recently, with the 440, and demand is high, but I was able to borrow one for a short period.

With 4MB of RAM, the 440 has plenty for ambitious use of all the Archimedes facilities, such as multiple “shadow” screens, sprites, and fonts, while still leaving enough for applications and data. The 440 also has a Winchester hard disc of 20MB fitted as standard. This spins continuously at 3600 rpm whenever the machine is switched on, (and quite drowns out any noise from the fan). However, the noise is not at all obtrusive, and it is quite possible eg to use the telephone, with the machine on just a few feet away.

The advantages are, firstly, that the storage medium itself is fixed, and cannot “go missing” – as tends to happen when you have lots of floppies. Secondly, the capacity of 20MB is a great convenience, and allows files to be much larger than can be held on a floppy disc. (Indeed, 4MB of RAM makes a “suitable” disc capacity essential). Thirdly, a Winchester drive

The 440, ArcWriter for all, and more on Fortran 77

usually has a higher data transfer rate, and this is particularly true for the Archimedes units. Whereas for the old Acorn Winchester, for the Model B/Master Series, it was about 64K/s, that for the Arc is some five times as great.

400 Series machines come with a 4-slot backplane as standard, to accept up to four hardware add-on “modules”. The large RAM memory and Winchester hard disc of the 440 extend significantly the potential of many such modules, and much of the software, that I have mentioned in previous reports. They are valuable in any professional situation – whether for a creator or user of large documents, databases, or spreadsheet models, or for a programmer. Some of the applications and languages are therefore discussed again below.

A large amount of RAM and a Winchester drive are particularly desirable for handling (digitised) graphics and sound data. Not only is this very demanding of storage space, but the high data rate can help to maintain a continuous output, when even 4MB of RAM is insufficient.

The 410 will be able to be upgraded from 1 to 4MB of RAM, and by adding a Winchester, but it is not due to become available until the “first quarter” of 1988. While the 300 Series can have a Winchester fitted, Acorn offer no upgrade to 4MB of RAM. Furthermore, the main circuit board does not support the full 32-bit expansion (for eg a floating point unit), or the hi-res mono hardware (see below) of the 400 Series.

The standard colour monitor is attractively priced, and fine for colour and graphics, but is marginal for intensive use

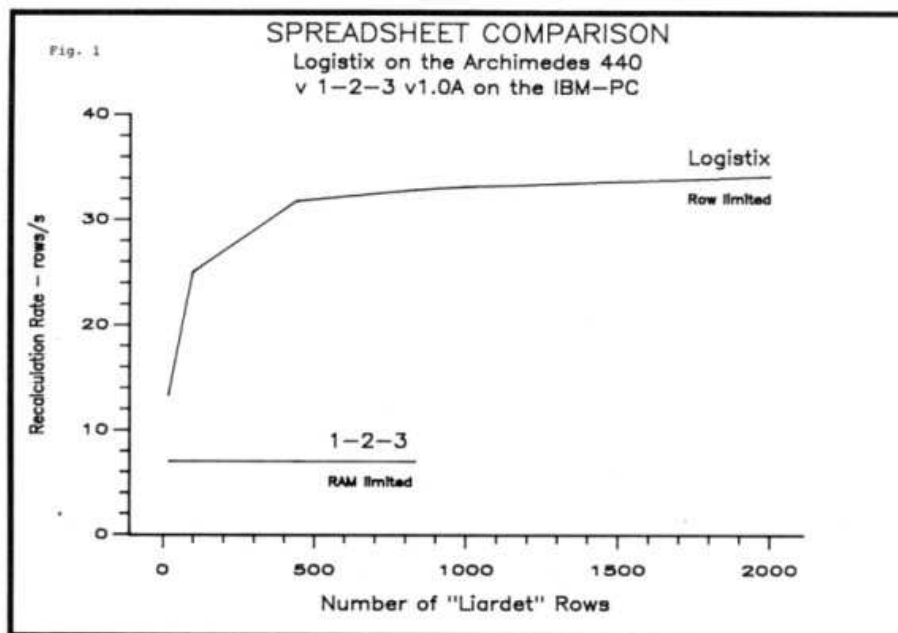
with 80-column text work. A monitor with a smaller dot pitch (eg 0.31 instead of 0.42 mm) gives much sharper displays, and – if multi-frequency – can also use the 512-line modes (with suitable software). While more expensive, it would account for a smaller proportion of the cost of a higher-priced 440-based system, which may well be purchased for “professional” use.

The 400 Series machines also have additional hardware to support two further screen modes. These are both high resolution monochrome, intended for applications such as DeskTop Publishing and CAD. Mode 22 supports text of 160 x 122 (when using the 8 x 8 system BFONT), and graphics of 1280 x 976, while Mode 23 is text only, with 144 x 54 (using an 8 x 16 font). The aspect ratio of the former is close to the 5:4 of several other Arc screen modes, while that of the latter is 4:3, the same as many Unix terminals. However, I was not able to sample these modes, due the lack of the additional hardware in the “loan” machine, and of a suitable high-frequency monochrome monitor.

The A440 without monitor costs £2299, with a mono monitor for £50 extra, and a colour monitor for £200 extra – all plus VAT. (The specifications and prices of this and some rival machines were compared in A&B, 87/8, p 14).

The A440 with the PC Emulator

Even the 310 and 410 machines can hold all the code of the all-software Acorn PC Emulator. However, while these provide some 400 K of “PC” RAM at the default settings, and up to 592K or so by “UN-PLUGging” various modules, the 440 can provide the full maximum of 640K (permitted by the architecture of the IBM-PC), at almost any settings. Although (as I have already reported) the PC Emulator is not fast, it is often sufficient that a program can be loaded and run at all, and an increasing number of packages require – or perform better with – the full 640K. When loading the PC Emulator into the



440, it is just possible to see that the "PC RAM" clocks up to 640K. After loading MS-DOS 3.2, this may be confirmed by running CHKDSK, which also shows that, with the System files present, 591K are free. Thus the 440 provides an environment that, at least on grounds of size, can handle any standard application that runs under MS-DOS 3.2. Moreover, the PC Emulator is remarkably "compatible" with the IBM-PC - with certain specific limitations, such as the floppy disc controller, and the serial port chip.

The Archimedes, and hence the PC Emulator, is compatible with the recently-launched IBM PS/2 machines, in using 3.5 inch floppy discs. These have also been used by the IBM-PC Portable, and most of the "compatible" portables for some time, so many MS-DOS applications are already available on such discs. However, much as for these machines, 5.25 inch floppy drives may be connected directly to the Archimedes. (Suitably adapted drives are available from Solidisk and Watford). Such drives are most often required in order to be able to read from, and write to, discs formatted for 360K on 40-tracks. If however, they are switchable to 80 tracks, they may also be used to read, write and format for 720K. This gives the advantage of the doubled capacity (greater than the RAM available in any standard PC), while using the lower-priced discs.

The PC Emulator can also use the other principal feature of the 440 - the Winchester hard disc. The Emulator comes complete with software to enable the hard disc to be divided into two "partitions" - one of 10MB for MS-DOS, leaving the other half for ADFS. Since the Acorn ADFS can handle file sizes of up to 512MB or more, the partition (or logical drive) for DOS is held as a single file on the ADFS-formatted Winchester. Hence, (provided that there is still just over 10MB of disc space free), the partition can be

created without having to back up all the ADFS files, in order to re-format the entire drive.

As a further convenience, the PC Emulator files and the MS-DOS files may be installed on the hard disc, each in their respective partitions. The Emulator may then be started up simply by entering *PC.Emulate, and hitting the space bar in response to the prompt for the MS-DOS disc.

As noted above, the Archimedes hard discs have an exceptionally high data transfer rate, but the result of the PCW "Store" test, using GW BASIC 3.20, was 30.25 s, compared with 38.6 s for a 720K floppy disc. These show how the performance is reduced when running an interpreted BASIC program, itself running under the PC Emulator. However, this test measures only one type of disc operation, and my subjective impression (over a wider range of operations, such as simple loading and saving) is that the speed is still acceptable.

When I first tried the PC Emulator, I tested WordStar for general handling speed, and measured the time to scroll the standard Byte document of 4000 words. (see A&B, 87/12, p 64). The results were poor, with the latter only about a quarter as fast as an IBM-PC, and the screen display suffered from temporary corruption. For this report, I therefore tried Ability 1.2, which had scrolled as fast as WordStar 3.3 on the Acorn 80186 Co-Processor. (see A&B, 87/7, p 92). Scrolling the Byte document took 111 s, which is slow (but not impossibly so), and is some 40 per cent as fast as an IBM-PC. Moreover, this was achieved without any ill-effects on the screen display. This versatile, low-priced, integrated package may therefore suit those seeking business applications to run under the Emulator.

The Acorn PC Emulator is sold with the A310 (as the 310M) for an extra £60,

plus VAT, and the same price applies if bought with the 400 Series. It is available now. For running DOS applications much faster, Acorn have announced their intention of producing a PC Podule. This is believed to be based on a 10 MHz 80186 (as used in the Master 512), but with a full 640K of "real" RAM. It should calculate over three times as fast as an IBM-PC - ie around seven times as fast as the PC Emulator.

The A440 with Logistix

The advantages of the 440 are far more apparent with applications which run in "native mode" (as opposed to running under an emulator). This is particularly true of Logistix, which I mentioned in A&B, 87/12, p 64. It is a large program (of some 400K), and while it runs well in a 1MB machine (ie 310 or 410), 4MB of RAM enables it to hold really large amounts of data, such as spreadsheet "models", databases, etc. Moreover, under the Archimedes "Arthur" Operating System, the 4MB is all directly addressed by the processor, as opposed to being treated as "paged memory" (eg as with EMS), or as a RAM disc. Hence such large models run as fast as smaller ones (rather than becoming much slower as soon as the 640K "limit" is exceeded).

As usual, I have used the "Liardet" model to measure the "true capacity" of Logistix as a spreadsheet, when running on the 440. Most unusually, this was limited by the number of rows (2048) rather than by the amount of RAM. However, since Lotus 1-2-3 v 1.0 A also has a maximum of 2048 rows, Logistix is not particularly short in practice. Rather is this a function of the particular model, which uses only 13 columns, and many models would be able to use more RAM memory without being limited by the number of rows. Indeed, Logistix can have many more columns than most spreadsheets - 1024, compared with only 256 for 1-2-3. This is to allow it to be used for time-related activities, such as project planning, with many time periods. When first loaded into a 440, Logistix comes up with 3147K free. This completely outweighs the fact that it uses almost twice the K per row, compared to 1-2-3.

Of course, a large "true capacity" is of little use (especially in interactive model development) if re-calculation is slow. Fortunately, Logistix on the 32-bit Archimedes re-calculates exceptionally quickly - far faster than eg 1-2-3 on any 16-bit PC or compatible. Figure 1 shows the "true capacity" and the re-calculation speed both for Logistix on the 440, and 1-2-3 on the IBM-PC. The former is 2048 rows, versus 828 for 1-2-3 - a factor of 2.5 - while the latter is up to 34 rows/s, versus 7 for 1-2-3 - a factor of almost 5. This means that it is probably comparable in speed to 1-2-3 running on a 16 MHz 80386 machine, (unless this is fitted with a Floating Point

Co-Processor). Replication, vertical and horizontal scrolling, and loading and saving are also fast with Logistix on the 440 – as is necessary if it is to be used for such big models.

It is worth mentioning again just how easy it is with Logistix, to produce business graphics – such as Figure 1 – with a professional appearance. This is aided powerfully by the accurate “preview” available on screen (and in a 512-line mode, if the monitor allows), before committing it to paper. Output was to a Plotmate A4SM, fitted with the HPGL ROM. Acornsoft Logistix for the Arc costs £99 plus VAT, and is available now.

ArcWriter

ArcWriter is the first word processor for the Arc that runs in the 32-bit “native mode” (as opposed to running under either the 6502 or PC emulators). It has been produced by Acornsoft, and will be available free to all the owners of Archimedes machines who return their registration cards (at least until further notice). Although supplying it free might appear to

discourage independent software houses, ArcWriter is intended to increase user satisfaction by providing a “native mode” application (of which word processing is the most popular). It can also be used (by dealers and others) to demonstrate the capabilities of the Arc, in comparison with its less powerful rivals.

The text is displayed in black on white by default, and, instead of the system font (as with Inter-Word and GEMWrite), ArcWriter uses the anti-aliased fonts supported by the Archimedes. They represent the standard type-writer fonts, such as Courier 10, and look very similar to how they appear on paper. Thus ArcWriter is capable of producing effects such as fonts of varying pitch (Pica: 10/inch, Elite: 12/inch, and Expanded: 5/inch), in normal, bold, and italic, without or with underlining, and also normal subscript and superscript – both on the printed page and also on screen, as the text is entered. It also allows the line spacing to be varied within the document (as an attribute of the current ruler). Page breaks are shown as a single line, so headers and footers are not

displayed on screen. However, (like View 3.0), they may include page numbers, and the system date and time, when printed.

ArcWriter is capable of handling not only the 128 characters of “7-bit” ASCII (like WordStar, WordWise, and Inter-Word), but (like View 3.0) up to 256 different characters of “8-bit” ASCII, including the many international accented ones, and special currency symbols, which make up the ISO Latin I set. These may be entered by compound key-presses, and displayed on screen, which makes ArcWriter particularly suitable for use with other European languages. However, not all printers support all these characters – especially in the case of daisy-wheels, which may have only 96 spokes.

ArcWriter has been deliberately kept simple, as a word processor without any additional page layout capability. Thus you cannot vary the “point” size of the font – either on screen or on paper, nor can the documents incorporate graphics. However, ArcWriter has been designed to exploit modern, dot-matrix printers to the full. In the interests of speed, all printing is done in “character” mode, while some of the effects can also be produced on a daisy-wheel printer. (While with most “page layout” or Desktop Publishing packages, varying “point” sizes, and embedded graphics can be included in documents, these have to use the printer in graphics mode. This is much slower than character mode with most dot-matrix machines, and makes a “page” – eg laser – printer almost essential).

While not as extensive as those of some of the “heavy-weight” word processors that run under MS-DOS, the functions of ArcWriter are probably sufficient for the majority of users. I shall not detail them here, but a good indication of the range available may be gained from the Menu Map shown in Figure 2, since ArcWriter is menu-driven (like Inter-Word), rather than command-driven (like WordStar). Moreover, selection from the menu is mainly by pointer and mouse, but with some also available on the function keys (like GEMWrite). Since not all the functions are available on keys, a mouse is essential.

ArcWriter runs under the Archimedes “WIMP” environment, using “windows” which may be scrolled both vertically and horizontally, “icons” and “menus” for selection, and a “pointer” on screen, which may be positioned with a mouse. The display is normally in Mode 12, which provides 640 x 256 x 16 colours with standard (colour) monitors. However, it can also use Mode 20 with a multi-frequency monitor. This has twice the vertical resolution, so that the anti-aliased characters remain the same size, but appear much better defined. Having invested in a Taxan Multi-Vision 770 Plus, I was able to try this, and the appearance of the text was even closer to “Courier 10” on paper!

Fig. 2 ARCWITER MENU MAP

Configure AW	Document Filing System	Floppy	
		Winchester	
	Printer	Network	
		Connection	
		Type	Serial
			Parallel
			Network
			PX Draft etc.
(Select)	Load Configuration		
	Save Configuration		
Setup Document	New		
	Paper Size – A4 etc		
	Define Margins		
	Define Header		
	Define Footer		
Filing	Load Document		
	Import File		
	Insert File		
	Delete Document		
	Rename Document		
	Save Document		
	Export File		
	New Directory		
(Menu)	New Disc		
Search and Replace – Global, Next (skip), Change, Cancel			
Go To Page			
Print Document (on continuous paper)			
Information	(paper size, page, lines, characters, memory free)		
System Window			
Exit			
Edit Mode	Font	Pica etc.	
	Show	Ruler	Line Spacing etc
		Separators	
	Underline		
	Insert		
	Overtyp		
Block Mode	Font	Pica etc.	
	Move		
	Copy		
	Delete		
	Save		
	Clear Block		

Although these modes are not normally inter-laced, there may still be a slight shimmering effect when showing a lot of white space. This may be reduced to an acceptable level by lowering the brightness. The effect may be accentuated on changing to Mode 20, since – with twice as many scan lines – it is inherently brighter at the same control setting. However, it can still be made acceptable with a lower brightness.

The size of an ArcWriter document is limited to 2000 lines. With the maximum visible width (of 69 Pica characters/line), this corresponds to about 20,000 words, or about 110K. This is of course over three times as large as most word processors for the Model B/Master Series, and is not unreasonable when used in a 305, since ArcWriter reserves a large buffer for block operations, and some space is needed for "caching" fonts, and storing sprites. The window displaying the document can be re-sized and re-positioned, but there is (at present) little point, since only one document can be open at once.

The ArcWriter program files, with all the fonts etc., take up some 560K in all. Hence, if working with a single floppy disc, this does not leave much for documents. A better strategy would be to load ArcWriter from one disc, and use a second disc to hold only the fonts and documents. The second disc could be used only for documents if the fonts required can be "cached" in RAM. However, they would occupy some 260K in all. (The FontSize, which makes an independent claim on RAM, outside the RM Area, should be configured to say 25 – ie 100K – to hold a reasonable selection of fonts). Discs may be changed (and "mounted") by pressing the middle (Menu) key when pointing at the Filing icon. ArcWriter documents are identified in directory catalogues by "doc" shown after the filename. Text may be

exported from, and imported to, ArcWriter as ASCII spool files.

Performance

Putting more information on the screen – whether in Mode 12 or Mode 20 – can affect the speed of screen handling, so I was particularly interested to measure the times taken for the standard "Byte" word processor tests. Initial loading of an existing document can take longer than you might expect, even with this fast machine and filing systems. The reason is that fonts are being loaded into ("cached" in) a special area of memory.

Scrolling with the cursor keys is (intentionally) not smooth, but such that it jumps six lines whenever the cursor reaches the top or bottom of the window. However, smooth scrolling can be effected by pointing at the arrows on the scroll bars, and holding down the left (Select) key. Screen update is subjectively quite quick.

Using the Byte 4000-word document, loading it from an 800K floppy disc took 16 s, saving it took 8.2 s, and searching from top to bottom took 3 s. For the scrolling test, I set the width to 80 (Pica) characters as usual, even though not all were visible, in order to keep the document length at 320 lines. I configured the key repeat rate to 4 throughout. In Mode 12, smooth scrolling from top to bottom with the scroll bar arrow took 92.2 s, but "jump" scrolling with the cursor keys took only 33.7 s. This is an excellent result, considering the amount of information on screen (80K), and quite acceptable in use. In Mode 20 (with twice as much information on screen), the smooth scroll took 148.7 s, and the "jumping" scroll took only 42 s.

Printing

The printers supported by ArcWriter are the dot-matrix Epson FX-80 in "draft"

mode, the same in "NLQ" mode (when available), the daisy-wheel Juki 6100, and a "simple printer". A utility is also provided for creating "custom" printer drivers. If printing is initiated from the menu, ArcWriter assumes the use of continuous paper (either fanfold, or cut sheets with a sheet feeder). For cut sheets fed by hand, the top of each page is brought up on screen with the "Page Down" key, and printing is initiated with the Print ("F13") key.

ArcWriter comes with a very good manual. It is well laid out, and has a detailed index.

Acornsoft Fortran 77

The Acornsoft Fortran 77 supports the full ANSI X3.9 – 1978 standard, popularly known as Fortran 77. It also offers several extensions, such as the WHILE..END..WHILE loop construct, "Include" statements, and bit manipulation functions. Moreover, names can be up to 255 characters long, and there is no limit on the length of CHARACTER values. It was written by TopExpress – who also wrote the Fortran 77 for the Acorn 32016 Cambridge Series. For those transferring from the older to the new machine, this should ensure that the language still has a familiar "feel".

Fortran was of course, the inspiration for BASIC, so the transition to this powerful compiling language should be relatively easy. With the capacity and speed of BBC BASIC 5 running on the Arc, users can now choose between the two for solving a wide range of problems. However, Fortran has also progressed, and -77 is much more flexible and friendly than earlier versions. It also has the advantages of a compiled language – ultimate speed, and security for the source code. As an indication of the relative speed, running the Byte (big) Sieve test

Fig. 3

		FORTRAN		COMPARISON			
		Times	in	seconds	and	Sizes in bytes	
Test	Compiler, Computer	Compile	Link	Execution	Speed	Object	Executable
					kWhets/s		
Whetstone	Acornsoft, Arc	9.1	10.6	102.5	97.6	6448	39772
Single	Lahey 2.2, AT	5	16	76	131	5536	29520
Precision	Microsoft 4.0, AT	33	21	61	169	7647	30288
	RM 2.11, AT	49	13	65	156	9267	36896
Whetstone	Acornsoft, Arc	9.8	11	112.3	89.0	6460	39860
Double	Lahey 2.2, AT	6	14	81	125	5557	29584
Precision	Microsoft 4.0, AT	34	21	65	156	7683	30352
	RM 2.11, AT	48	13	70	142	9635	37344
					Mflop/s		
Linpack	Acornsoft, Arc	29.5	17	~1860	0.0115	18112	368860
Single	Lahey 2.2, AT	17	22	1131	0.0183	20394	366624
Precision	Microsoft 4.0, AT	116	26	1002	0.0197	25867	363040
	RM 2.11, AT	95	19	1094	0.0192	29320	374720
AT Results		from		Byte	November 1987, p193		

(size 8190, 10 iterations) in (RAM) BASIC 5 took 49.7 s, compared with 1.82 s in Acornsoft Fortran 77 – a factor of 27 longer!

The Acornsoft compilers for the Arc (C, Fortran, and Pascal etc) are true 32-bit implementations which run as such under the Arthur Operating System. Conversely, all the compilers that run under DOS are limited to 16-bit operation, even when running on 80386 machines. It is only possible to achieve 32-bit operation in this latter case by running under another operating system.

Moreover, some DOS Fortran compilers do not provide a Floating Point Emulator: the machine has to be fitted with a hardware Floating Point Unit. Conversely, the Acornsoft Fortran does not require an FPU (and indeed none is yet available – even for the 400 Series – and none will be offered for the 300 Series). Instead, it uses a Floating Point Emulator which is supplied on the Archimedes Welcome Disc.

In addition to the standard Fortran 77 library provided, Acornsoft Fortran 77 can be further extended by linking in routines written in ARM Assembler. Acorn provided me with an assembled timing routine, and added "call" statements to the Linpack program, in order to obtain results for this widely-used benchmark. (The speed cannot be determined correctly from the overall execution time.) Acorn plan to offer extensions supporting the Archimedes "OSBYTE", "OSWORD", and "OSCLI" (star command) calls. Later, a full "Arthur" Library for Acornsoft Fortran is planned, permitting direct access (via "SWIs") to all the resources of the machine, including graphics and sound.

The Acornsoft Fortran 77 compiler works by loading itself into RAM, and then reading from, and writing to, files on disc. The compilation options include warnings about the use of extensions to the Fortran 77 language, the ability to use Fortran 66 features, and facilities for setting warnings, and for embedding tracing code. Running on a machine with a linear address space, Acornsoft Fortran 77 is almost free from constraints on program size. Both code and data are limited only by the memory available, provided that the code does not exceed 128K per module. This is of course in remarkable contrast to compilers running under MS-DOS, with their profusion of "small", "extended", and "huge" models – all subject to different limits on code and data size, and with consequences on execution speed and file sizes.

Of the Acornsoft Fortran 77 package, the "front end" of the compiler is some 135K, and the "code generator" about 130K. This is also approximately the space they occupy in turn in RAM. Together with the Linker of some 113K, and the Library of 168K, and minor files, they take up 616K. On a floppy disc of

800K, this leaves only 184K for source, object, and executable files. Hence, although program development is possible with only a single floppy drive, it is easier with two, and best with a Winchester – which is also faster.

It is worth mentioning again that the PC Emulator includes utilities which allow simple text files – such as the source files for Fortran and other languages – to be transferred between DOS 360K and 720K formats, and ADFS 640K and 800K formats. This is of increasing importance, since the Arc can now tackle computing tasks that formerly required a mini-computer or a mainframe.

Performance

The Acornsoft Fortran 77 on the Arc is compared with three Fortran 77s running on a standard 8 MHz IBM-PC AT in Figure 3. I have shown results only for the Whetstone and Linpack benchmarks, although they both emphasise floating point calculations, since they are the only tests usually carried out in Fortran. Conversely, most of the accepted integer benchmarks, such as the Sieve and Dhrystone tests, are usually run in C. As I have already shown (in A&B, 88/1), the Acornsoft C running on the Arc is faster on these tests than any running on a 16 MHz 80386 machine, or a Mac II. As a matter of interest, the time for the Byte Sieve test run in Acornsoft Fortran was 1.82 s, compared with 0.57 s in C. However, speed is not everything when choosing a language. Fortran has been around much longer, and is therefore capable of making use of the vast number of existing routines. Also, it can handle special operations, such as arithmetic on complex numbers. The Linpack test also has the advantage that it is a substantial program – larger than most other benchmarks. Nevertheless, the Acornsoft, Arc combination "crunched" it faultlessly, without any drama.

This emphasis on floating point calculations shows the Arc at a disadvantage in the speed results, since it used only a software Floating Point Emulator, whereas the AT was fitted with a hardware Floating Point Unit (an 80287, running at 6 MHz). In these circumstances, the Acornsoft, Arc combination acquitted itself well, and came within a factor of two or less of the best in each test. Acorn have announced their intention of offering a hardware floating point unit for the 400 Series machines. This should increase their performance on such tests by up to a factor of ten, and put it ahead of an 8 MHz AT with FPU by a factor of four or more. For the majority of calculations which are actually integer, the Acornsoft Fortran, Arc combination should already be faster than any Fortran 77 running on a standard 8 MHz AT (or PS/2-50).

However, the compile and link times for the Acornsoft Fortran 77, Arc combination may be compared without reser-

vation. These tests show it to be second only to the Lahey/AT combination on compiling, and the fastest on linking. Moreover, the Arc was using a Winchester, where the AT used a RAM disc, which is usually faster.

On object file sizes, the Acornsoft/Arc combination produced the smallest or second smallest, but on executable file sizes, it produced the largest – albeit by a narrow margin – save on the Linpack test, where it was the second largest within a small spread. This suggests that the code produced for a RISC processor (the ARM) need not be much if any larger than that for a CISC processor (the 80286, running in 8086 mode).

The documentation is a slim 54-page manual, which contains an adequate guide to the use of the compiler, and to the language implementation/features, but very few examples. Input/Output, and Errors and Debugging are also covered, but it has only one paragraph on the Linker. This is covered more fully in the Programmer's Reference manual, which is a two-volume set of some 660 pages, and costs £29.95. As its name implies, this Manual would in any case be essential for any serious programmer of the Arc. Acornsoft Fortran 77 is priced at £99 plus VAT, and is available now.

The Acornsoft Fortran 77 includes a linker, but not an editor – though "Twin", which was developed and is widely used in Acorn itself, is available for only £29.00 plus VAT. Now that Twin supports Mode 18 (with a multi-frequency monitor), up to 64 lines may be displayed on screen during program development. A symbolic, source-level debugger is currently being developed.

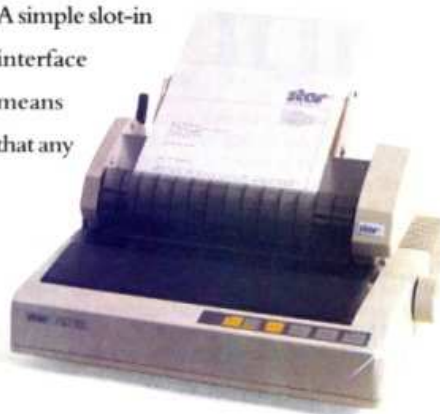
Conclusions

With 4MB of RAM and a 20MB Winchester enhancing the 32-bit Archimedes architecture, the 440 provides astonishing computing power and value. Evidence of this is shown in the standard of the add-on hardware "modules" announced, and the languages and application software already available. Not only can the Archimedes do a creditable job of emulating a 16-bit computer (to run MS-DOS programs such as 1-2-3), but the full 32-bit applications such as Logistix and ArcWriter leave them completely outclassed. ArcWriter shows how good text can look on screen, and uses the Acorn Windows and Mouse environment to the full, as aids to productivity. Logistix and ArcWriter join the "paint" programs: Welcome Paint and Clare's Artisan, and the databases: Minerva DeltaBase, and Minerva System Delta Plus – all of which run in full 32-bit "native mode". The Acornsoft Fortran 77 language for the Arc will also help scientific and technical users to realise the "main-frame" power that they can now put on their desks.

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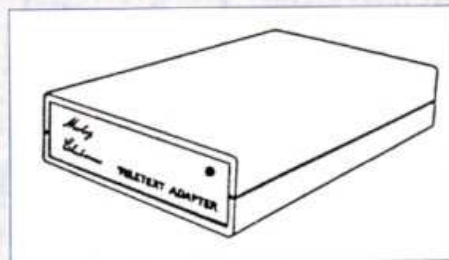
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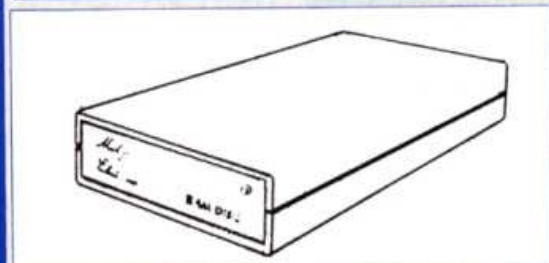
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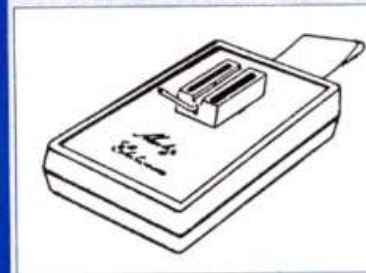
One megabyte of RAM connected to the 1MHz bus. Used with the supplied ROM software programs and files may be saved and loaded from the RAMdisc in the same manner as from a floppy disc with a large increase of speed, for example, a 20k mode 0 screen takes about 3-4 seconds to load from disc and about 0.2-0.3 seconds to load from the RAMdisc. The RAMdisc ROM operates as a utility ROM

RAMDISC

working with the current filing system rather than as a separate filing system. Therefore ensures compatibility with any Acorn compatible DFS (not ADFS). The RAMdisc can be selected by a * command to take the place of any drive number from 0 to 9. If the RAMdisc replaces a floppy drive as 0 for example, all commands addressed to drive 0 will be intercepted by the RAMdisc. The default drive number is 4. Any 'Dangerous' *commands such as *COMPACT, *COPY, *BACKUP etc can be intercepted and the BBC's RAM from page 2 to &7FFF saved to RAMdisc workspace, and may be recovered using a *command. This prevents accidental corruption of any programs/data in RAM you may have been using at the time. The filing system wedge ROM supplied supports load/save, byte file access, all relevant OSFSC commands, and contains a formatter verifier and 'sector' editor for use with the RAMdisc. Catalogue structure allows up to 2,688 files.

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The comprehensive user friendly software included in the package has two main parts, the first allows EPROMS to be read, programmed, verified and edited, also allowing a ROM image to be loaded or saved to disc. The second is a full ROM management system in its own right, which has a host of useful features and routines, such as KILL and RESURRECT ROM to disable or enable a sideways ROM, dump ROM image to buffer or disc, move ROM image in buffer to sideways RAM, and VIEW-SEARCH any sideways ROM.

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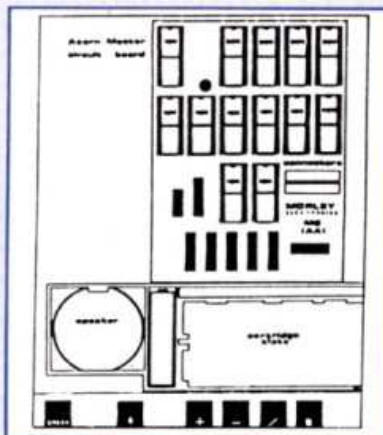
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ARCHIMEDES GAME

ARCHIEBALL

ARCHIEBALL is a program written entirely in ARM BASIC version 5, and is a good example of what can be achieved with the Archimedes.

The game is in the bat-and-ball genre, but includes capsules, impenetrable bricks, and a screen designer.

The program makes quite extensive use of the sprite facilities on the Archimedes. Before entering the program you have to first set up a sprite file called "ArchBalSpr", which should consist of the sprite designs shown in table A. Use the SEDIT program on the Welcome disc to define these sprites, with details of using the utility shown in Chapter 13 of the User Guide.

If you get an error message while creating the sprites, you have probably not set aside sufficient space in the computer for the sprites. To solve this solution, save the sprite file so far and then type:

***CONFIGURE SPRITESIZE 10**

and do a <CTRL-BREAK>. Then load the file in again and continue as normal.

Type: ***VOICES**

to see the voices currently installed. The first five should read:

- 1 WaveSynth-Beep
- 2 Percussion-Soft
- 3 Percussion-Medium
- 4 Percussion-Snare
- 5 Percussion-Noise

If this is not the case then you will have to *RMLOAD the Percussion module off the welcome disc.

Your bat movements are controlled by the mouse, with any button firing off the ball at the start or when it is caught. Details of the brick and capsule types are included in the program instructions.

The screen definer is very easy to use. You just select the brick type you want by clicking the mouse over it and then place it on the screen by clicking the mouse over the place you want the brick. Happy bouncing!



Archiball features:

- Screen designer - the Archiball construction set
- Multiple bats and balls
- Fast ball, slow ball
- Catch ball
- Break out of screen

Is Archiball invinciball? Send in your high scores, but no cheating!

Suggestions:

Use other sound modules for outlandish sound effects

Implement code words at the end of each set of screens for more impact



```

10REM >Archiball - Archime
des Only
20REM written by Keith McAl
pine
30REM with help from Gem El
ectronics
40REM (C)1987 A&B Computing
60ON ERROR:IF ERR=17 THEN P
RODinitial_display:GOTO120 ELS
E MODE7:REPORT:PRINT" @ line "
;ERL:END
70hi%=10:key=-1:demo%=0
80changed%=FALSE
90PROCset_system
100PROCinitial_display
120REPEAT
130IF key>48 AND key<52 AND
demo% THEN demo%=0:GOTO160
140PROCTitles
150IF demo% THEN scr%=RND(5)
:lives%=1:scr%=0:GOTO180
160ON key-48 GOTO 170,4340,4
310
170scr%=1:scr%=0:lives%=4
180REPEAT
190GCOL 0:RECTANGLE FILL 0,0
,1148,864
200grey%=0:area%=0
210PROCdraw_screen
220PROCinit
230*SCHOOSE 1
240GCOL 11,0
250MOUSE batx%,A,A
260PLOT&ED,batx%,48
270IF bricks%=0 THEN 300
280K=INKEY(150)
290GCOL3,6:MOVE110,120:PRINT
"Hard bricks need ";hits%:" hi
ts each."
300GCOL11,0
310*SCHOOSE 2
320PLOT &ED,batx%,bally%
330*FX21
350ax%=0:ay%=0:speed=INT(scr
%*.3)+3:IF speed>6 speed=6

```

```

360sx%=0:sy%=0
370catch%=TRUE:TIME=0
380capsule%=FALSE:cx%=0:cy%=
0:ocx%=0:ocy%=0
390breakout%=FALSE:breaktime
%=0
400B%=0
420REPEAT
430IF capsule% AND TIME>T% T
HEN VDU23,27,0,capsule%+2:PLO
T&ED,cx%,cy%:capsule%=0
440IF breakout% AND (batx%>=
1056 OR TIME>breaktime%) THEN
450VDU23,27,0,B1:GCOL8,0:PLO
T&ED,1148,0:GCOL 11,0:breakout
%=0:breaktime%=0
460IF batx%>=1056 THEN brick
s%=0
470ENDIF
480speed+=0.0005:IF speed>8
speed=8
490PROCmove_bat
500PROCupdate_ball
510UNTIL bricks%<=0 OR lives
%=0
520IF lives%=0 THEN 540
530scr%+=1:IF scr%>50 scr%=1
540UNTIL lives%<=0 OR demo%
550IF key<>-1 AND demo% THEN
570
560PROCgame_over
570UNTIL 0
580END
600DEF PROCdraw_screen
610COLOUR 134:COLOUR 3
620VDU4,28,0,31,39,0:COLOUR
2:PRINTTAB(15,2);scr%:" "
630PRINTTAB(23,2);lives%:" "
TAB(30,2);hi%
640PRINTTAB(5,2);" "
650chr%=(scr%-1)MOD 10)+238
660COLOUR128:COLOUR15,RND(6)
*16,RND(6)*16,RND(6)*16:COLOUR
15
670FOR lp%=5 TO 31:PRINTTAB(
2,lp%);STRING$(36,CHR$(chr%));N
EXT
680COLOUR134:COLOUR2
690addr%=(scr%-1)*200
700bricks%=screen%(addr%+18
0)
710IF bricks%=0 THEN VDU5:EN
DPROC
720FOR lpy%=144 TO 816 STEP
48
730FOR lpx%=0 TO 1056 STEP 9
6
740A=screen%(addr%
750hits%=(scr%-1) DIV 2)+2:
IF hits%>6 hits%=6
760addr%+=1
770VDU 5:MOVE lpx%,lpy%+48
780GCOL 3,A:PRINT brick%
790x%=(lpx% DIV 96)*6+1:y%
=((lpy% DIV 48)*3)+1
800IF A=1 THEN grey%(x% DIV
6,y% DIV 3)=hits%
810IF A=0 THEN B90
820area%(x%,y%)=8:area%(x%+1
,y%)=2:area%(x%+2,y%)=2:area%(
x%+3,y%)=2:area%(x%+4,y%)=2:ar
ea%(x%+5,y%)=7
830area%(x%,y%+1)=3:area%(x%
+1,y%+1)=9:area%(x%+2,y%+1)=9:
area%(x%+3,y%+1)=9:area%(x%+4,

```


A R C H I M E D E S G A M E

```

y%+2)=1:area%(x%+5,y%+2)=6
850FOR wly%=0 TO 2
860FOR wlx%=0 TO 5
870area%(x%+wlx%,y%+wly%)+=A
*16
880NEXT,
890NEXT,
900GCOL3,6:MOVE110,120:PRINT
"Hard bricks need ";hits%;" hi
ts each."
910ENDPROC
920
930DEFPROCset_system
940DIM area%(72,54),grey%(12
,18),screen% 10000
950*SNEW
960*SLOAD ArchBalSpr
970*SCOPY 1 9
980*SFLIPX 9
990file=OPENIN("screens"):CL
OSE#0:IF file=0 THEN PROCcreat
e
1000OSCLI("LOAD screens "+STR
$~screen%)
1010MODE9
1020FOR lp%=0 TO 7
1030READ r,g,b:COLOUR lp%,r*1
6,g*16,b*16
1040COLOUR 15-lp%,r*16,g*16,b
*16:NEXT
1050VDU23,8202,0,0,0;
1060VDU23,238,204,204,51,51,2
04,204,51,51
1070VDU23,239,24,36,90,189,18
9,90,36,24
1080VDU23,240,129,66,36,24,24
,36,66,129
1090VDU23,241,1,3,5,9,29,51,6
5,0
1100VDU23,242,0,204,51,0,0,20
4,51,0
1110VDU23,243,36,126,255,99,9
9,255,126,36
1120VDU23,244,16,108,198,186,
68,40,16,0
1130VDU23,245,192,48,12,3,3,1
2,48,192
1140VDU23,246,36,126,255,126,
126,255,126,36
1150VDU23,247,36,36,231,0,0,2
31,36,36
1160ENDPROC
1170
1180DEFPROCinit
1190*CHANNELVOICE 1 Percussio
n-Medium
1200MOUSE RECTANGLE 0,48,1056
,0
1210MOUSE STEP 1,0
1220ballx%=528:bally%=88
1230oballx%=ballx%:obally%=ba
lly%
1240MOUSE TO 500,48:batx%=500
:obatz%=batx%
1250ENDPROC
1260
1270DEFPROCmove_bat
1280obatz%=batx%
1290IF demo% THEN PROCdemo:GO
TO 1320
1300MOUSE batx%,A,B%
1310IF (catch% AND ay%=0 AND
B%<>0) THEN ax%=1:ay%=4:catch%
=0:PROCcheck_bat
1320IF capsule% THEN
1330IF (batx%>cx% AND batx%<c
x%+64) OR (batx%+94>cx% AND ba
tx%+94<cx%+80) THEN PROCcapsul
e
1340ENDIF
1350VDU23,27,0,1;
1360PLOT&ED,obatz%,48
1370PLOT&ED,batz%,48
1380ENDPROC
1390
1400DEFPROCdemo
1410batx%+=sx%+RND(6)-RND(6)
1420IF batx%<8 batx%=8
1430IF batx%>1056 batx%=1056
1440IF catch% AND ay%=0 THEN
ax%=1:ay%=4:catch%=0:PROCcheck
_bat
1450key=INKEY(0):IF key<>-1 T
HEN bricks%=0:ballx%=oballx%:b
ally%=obally%
1460ENDPROC
1470
1480DEFPROCupdate_ball
1490oballx%=ballx%:obally%=ba
lly%
1500sx%=(speed*ax%):sy%=(spee
d*ay%)
1510ballx%+=sx%:bally%+=sy%
1520bx%=(INT(ballx%/16))+1:by
%=(INT(bally%/16))+1
1530IF bx%<1 OR bx%>71 THEN a
x%=-ax%:ballx%-=sx%*2
1540IF by%>54 THEN ay%=-ay%:b
ally%-=sy%*2
1550bx%=(INT(ballx%/16))+1:by
%=(INT(bally%/16))+1
1560IF bally%<=88 THEN PROCch
eck_bat:GOTO 2020
1570check%=area%(bx%,by%) MOD
16
1580col%=area%(bx%,by%) DIV 1
6
1590IF check%=0 THEN 2020
1600CASE check% OF
1610WHEN 1:PROCwipebrick:IF a
y%<0 ay%=-ay% ELSE ax%=-ax%
1620WHEN 2:PROCwipebrick:IF a
y%>0 ay%=-ay% ELSE ax%=-ax%
1630WHEN 3:PROCwipebrick:IF a
x%>0 ax%=-ax% ELSE ay%=-ay%
1640WHEN 4:PROCwipebrick:IF a
x%<0 ax%=-ax% ELSE ay%=-ay%
1650WHEN 9:ballx%-=INT(sx%/2)
:bally%-=INT(sy%/2):GOTO 1520
1660WHEN 5,6,7,8:
1670PROCwipebrick
1680IF ax%<0 AND (check%=5 OR
check%=8) THEN ay%=-ay%:GOTO
2000
1690IF ax%>0 AND (check%=6 OR
check%=7) THEN ay%=-ay%:GOTO
2000
1700IF ay%>0 AND (check%=5 OR
check%=6) THEN ax%=-ax%:GOTO
2000
1710IF ay%<0 AND (check%=7 OR
check%=8) THEN ax%=-ax%:GOTO
2000
1720IF check%=7 THEN
1730IF x%>=67 THEN 1750
1740IF area%(x%+6,y%)>0 THEN
ay%=-ay%:GOTO 1780
1750IF y%<=7 THEN 1770
1760IF area%(x%,y%-3)>0 THEN
ax%=-ax%:GOTO 1780
1770ay%=-ay%
1780ENDIF
1790IF check%=6 THEN
1800IF x%>=67 THEN 1820
1810IF area%(x%+6,y%)>0 THEN
ay%=-ay%:GOTO 1850
1820IF y%>=52 THEN 1840
1830IF area%(x%,y%+3)>0 THEN
ax%=-ax%:GOTO 1850
1840ay%=-ay%
1850ENDIF
1860IF check%=5 THEN
1870IF x%<=1 THEN 1890
1880IF area%(x%-6,y%)>0 THEN
ay%=-ay%:GOTO 1920
1890IF y%>=52 THEN 1910
1900IF area%(x%,y%+3)>0 THEN
ax%=-ax%:GOTO 1920
1910ay%=-ay%
1920ENDIF
1930IF check%=8 THEN
1940IF x%<=1 THEN 1960
1950IF area%(x%-6,y%)>0 THEN
ay%=-ay%:GOTO 1990
1960IF y%<=7 THEN 1980
1970IF area%(x%,y%-3)>0 THEN
ax%=-ax%:GOTO 1990
1980ay%=-ay%
1990ENDIF
2000ENDCASE
2010ENDPROC
2020VDU23,27,0,2;
2030*FX19
2040PLOT &ED,oballx%,obally%
2050PLOT &ED,ballx%,bally%
2060ENDPROC
2070
2080DEFPROCwipebrick
2090VDU23,27,0,2;
2100x%=bx%-((bx%-1) MOD 6)
2110y%=by%-((by%-1) MOD 3)
2120IF col%=1:grey%(x% DIV 6,
y% DIV 3)-=1:IF grey%(x% DIV 6
,y% DIV 3)>0 THEN col%=2
2130IF col%=2 THEN 2170
2140area%(x%,y%)=0:area%(x%+1
,y%)=0:area%(x%+2,y%)=0:area%(
x%+3,y%)=0:area%(x%+4,y%)=0:ar
ea%(x%+5,y%)=0
2150area%(x%,y%+1)=0:area%(x%
+1,y%+1)=0:area%(x%+2,y%+1)=0:
area%(x%+3,y%+1)=0:area%(x%+4,
y%+1)=0:area%(x%+5,y%+1)=0
2160area%(x%,y%+2)=0:area%(x%
+1,y%+2)=0:area%(x%+2,y%+2)=0:
area%(x%+3,y%+2)=0:area%(x%+4,
y%+2)=0:area%(x%+5,y%+2)=0
2170GCOL11,0
2180*FX19
2190PLOT &ED,oballx%,obally%
2200IF col%=2 THEN 2350
2210GCOL 3,col%
2220MOVE ((x%-1)/6)*96,((y%-1
)/3)*48+48:PRINT brick#
2230bricks%-=1
2240PROCscore(col%)
2250IF capsule%=0 AND RND(scr
%*5)>RND(scr%*10) THEN
2260capsule%=RND(5):cx%=RND(1
084):cy%=50
2270IF cx%>batx%-280 AND cx%<
batx%+292 THEN 2260
2280VDU23,27,0,capsule%+2;
2290GCOL 11,0
2300PLOT&ED,cx%,cy%
2310T=TIME+85:IF capsule%=5
T%=TIME+45
2320VDU23,27,0,2;
2330ENDIF
2340GCOL11,0
2350PLOT &ED,ballx%,bally%
2360SOUND 1,-10,5,.5
2370ENDPROC
2380
2390DEFPROCcheck_bat
2400IF bally%>88 THEN ENDPROC
2410IF catch% THEN
2420bx%=ballx%+(batx%-obatz%):
IF bx%>=(batx%-12) AND bx%<=(
batx%+96) AND bally%>52 THEN a

```


A R C H I M E D E S G A M E

```
x%=0:ay%=0:ballx%=bx%:bally%=8
B:ENDPROC
2430ENDIF
2440IF bally%<=0 THEN PROCdea
d:ENDPROC
2450IF bally%>52 AND ballx%>(
batx%-12) AND ballx%<=(batx%+9
6) THEN
2460SOUND 1,-10,1,1
2470IF ballx%<(batx%) THEN ax
%=-4:ay%=1:ENDPROC
2480IF ballx%>(batx%+80) THEN
ax%=4:ay%=1:ENDPROC
2490IF ballx%<(batx%+16) THEN
ax%=-2:ay%=3:ENDPROC
2500IF ballx%>(batx%+64) THEN
ax%=2:ay%=3:ENDPROC
2510IF ballx%<(batx%+32) THEN
ax%=1:ay%=4:ENDPROC
2520IF ballx%>(batx%+48) THEN
ax%=1:ay%=4:ENDPROC
2530ay%=ABS(ay%)
2540ENDIF
2550ENDPROC
2560
2570DEFPROCbox(a%,b%)
2580GCOL 5
2590RECTANGLE FILL a%*32,912,
(b%*32)-4,96
2600GCOL 6
2610RECTANGLE FILL (a%*32)+8,
920,(b%*32)-20,80
2620ENDPROC
2630
2640DEFPROCscore(num%)
2650VDU4
2660sc%+=num%
2670PRINTTAB(5,2);sc%
2680IF sc%>hi% hi%=sc%:PRINTT
AB(30,2);hi%
2690speed+=num%/250
2700VDU5
2710ENDPROC
2720
2730DEFPROCcapsule
2740VDU23,27,0,capsule%+2:PL
OT&ED,cx%,cy%
2750catch%=0
2760CASE capsule% OF
2770WHEN 1:catch%=TRUE:TIME=-
500
2780WHEN 2:speed=speed/1.5:IF
speed<2 speed=2
2790WHEN 3:speed=speed*1.5:IF
speed>8 speed=8
2800WHEN 4:lives%+=1:VDU4:PRI
NTTAB(23,2);lives%;" ":VDU5
2810WHEN 5:GCOL 3:RECTANGLE F
ILL 1152,0,150,100:breakout%=T
RUE:GCOL11,0:breaktime%=TIME+1
00
2820ENDCASE
2830capsule%=0
2840VDU7
2850ENDPROC
2860
2870DEFPROCinitial_display
2880VDU26:GCOL 7
2890RECTANGLE FILL 0,0,60,102
4
2900RECTANGLE FILL 1219,0,60,
1024
2910RECTANGLE FILL 0,864,1279
,300
2920ORIGIN 640,-256:GCOL 4
2930FOR lp%=32 TO 4000 STEP 6
4
2940MOVE 0,0:DRAW lp%,1280
2950MOVE 0,0:DRAW -lp%,1280
2960NEXT
```

```
2970ORIGIN 0,0:GCOL 0
2980RECTANGLE FILL 64,0,1148,
864
2990PROCbox(4,7):PROCbox(13,6
)
3000PROCbox(21,6):PROCbox(29,
7)
3010VDU4:COLOUR 134:COLOUR 3
3020PRINTTAB(5,1)"SCORE"TAB(3
1,1)"TOP"
3030VDU5:GCOL3
3040MOVE 432,991:PRINT"ROUND"
3050MOVE 688,991:PRINT"LIVES"
3060MOVE 1212,0:MOVE 1279,100
:SGET 8
3070VDU23,224,0,127,255,255,2
55,255,255,255
3080VDU23,225,0,255,255,255,2
55,255,255,255
3090VDU23,226,0,252,254,254,2
54,254,254,254
3100VDU23,227,255,255,255,127
,0,0,0
3110VDU23,228,255,255,255,255
,0,0,0
3120VDU23,229,254,254,254,252
,0,0,0
3130brick%=CHR$224+CHR$225+CH
R$226+CHR$10+STRING$(3,CHR$8)+
CHR$227+CHR$228+CHR$229
3140ORIGIN 64,0
3150ENDPROC
3160
3170DEFPROCgame_over
3180PROCwipeobjs
3190*CHANNELVOICE 1 1
3200GCOL11,0:VDU23,27,0,1:
3210obaty%=48
3220FOR lp=0 TO 1.1*PI STEP P
I/45
3230*FX19
3240PLOT&ED,batx%,obaty%
3250IF lp>PI/2 THEN VDU23,27,
0,9: ELSE VDU23,27,0,1:
3260obaty%=480*SIN(lp)+48
3270PLOT&ED,batx%,obaty%
3280SOUND&1001,-15,(obaty%/5)
+30,3
3290K=INKEY(3):NEXT
3300GCOL4:MOVE290,500:PRINT "
G A M E O V E R"
3310GCOL0:MOVE292,504:PRINT "
G A M E O V E R"
3320*FX15,0
3330VDU28,2,31,37,5:COLOUR128
3340KK=FNscroll
3350ENDPROC
3360
3370DEFPROCdead
3380PROCwipeobjs
3390FOR lp%=1 TO 6
3400OSCLI("CHANNELVOICE 1 "+S
TR$(RND(4)+1))
3410SOUND &1001,-10,50,3
3420K=INKEY(6):NEXT
3430ax%=0:ay%=0
3440sx%=0:sy%=0
3450ballx%=batx%+24:bally%=88
3460GCOL11,0:VDU23,27,0,2:PL
OT&ED,ballx%,bally%
3470oballx%=ballx%:obally%=ba
lly%
3480lives%-=1
3490VDU4:PRINTTAB(23,2);lives
%;" ":VDU5
3500*CHANNELVOICE 1 Percussio
n-Medium
3510TIME=0
3520catch%=TRUE
3530ENDPROC
```

```
3540
3550DEFPROCwipeobjs
3560GCOL11,0
3570VDU23,27,0,2:PL0T&ED,oba
llx%,obally%
3580IF capsule% THEN VDU23,27
,0,capsule%+2:PL0T&ED,cx%,cy%
:capsule%=0
3590IF breakout% THEN VDU23,2
7,0,8:GCOL8,0:PL0T&ED,1148,0:
breakout%=0
3600ENDPROC
3610
3620DEFPROCtitles
3630*POINTER 0
3640GCOL 0:RECTANGLE FILL 0,0
,1148,864
3650VDU28,2,31,37,5
3660REPEAT
3670demo%=0
3680VDU5:FOR col%=7 TO 1 STEP
-1
3690GCOL col%:MOVE 268+col%*2
,(col%*4)+700:PRINT"A R C H I
E N O I D"
3700NEXT
3710VDU4:COLOUR5:COLOUR128:PR
INTTAB(9,8)"by Keith McAlpine
"
3720COLOUR3:PRINTTAB(7,10)"(C
) 1988 A&B Computing"
3730COLOUR1:PRINTTAB(15,14)"S
elect"
3740COLOUR RND(7):PRINTTAB(8,
17)"1... Play Game"
3750COLOUR RND(7):PRINTTAB(8,
19)"2... Screen designer"
3760COLOUR RND(7):PRINTTAB(8,
21)"3... Quit"
3770COLOUR1:IF changed% PRINT
TAB(2,25)"These screens haven'
t been saved"
3780k=FNscroll:IF k THEN 4010
3790K=RND(2):IF K=1 demo%=-1:
GOTO4010
3800GCOL8,0
3810RESTORE 4290
3820PRINTTAB(14,4)"CAPSULES"
3830FOR lp%=3 TO 7:VDU 23,27,
0,lp%:
3840READ name$
3850VDU5:GCOL RND(7):MOVE 400
,(lp%*100)-125:PRINT name$
3860GCOL RND(7):MOVE 402,(lp%
*100)-129:PRINT name$
3870PLOT&ED,230,(lp%*100)-150
3880NEXT
3890k=FNscroll:IF k THEN 4010
3900VDU4:PRINTTAB(15,4)"BRICK
S":VDU5
3910FOR lp%=1 TO 6
3920GCOL lp%:MOVE 230,(lp%*10
0)+50:PRINT brick$
3930GCOL RND(7):MOVE 400,(lp%
*100)+35
3940CASE lp% OF
3950WHEN 2:PRINT"Impenetrable
brick"
3960WHEN 1:PRINT"Hard brick"
3970OTHERWISE PRINT"Worth ";1
p%;" points"
3980ENDCASE
3990NEXT lp%
4000k=FNscroll
4010UNTIL k OR demo%
4020ENDPROC
4030
4040DEFNscroll
4050key=INKEY(400)
4060IF key>48 AND key<52 THEN
```


A R C H I M E D E S G A M E

```

=-1
4070dir%=RND(4)-1
4080lp%=0
4090REPEAT
4100*FX19
4110VDU 23,7,0,dir%:
4120key=INKEY(1)
4130lp%+=1
4140UNTIL lp%=40 OR (key>48 A
ND key<52)
4150IF (key>48 AND key<52) TH
EN =-1
4160=0
4170
4180DEFPROCcreate
4190PRINT "Please wait. Crea
ting 'screens' file."
4200FOR lp%=0 TO 10000 STEP 4
4210screen%:lp%=0:NEXT
4220OSCLI("SAVE screens "+STR
$~screen%+" +2711")
4230ENDPROC
4240
4250REM ***** Colour Data ***
**
4260DATA 0,0,0,11,11,11,10,5,
0,15,4,0,13,15,0,0,7,15,0,15,8
,15,7,15
4270DATA 10,0,12,0,13,0,0,2,1
5,15,0,0,15,6,0,12,12,0,11,11,
11
4280REM ***** Capsule Names *
****
4290DATA Catch ball,Slow ball
,Fast ball,Extra bat,Break out
of screen
4300
4310MODE7:PRINT "Bye"
4320END
4330
4340REM ***** SCREEN DESIGNER
4350VDU26,4:COLOUR128:CLS:OFF
4360COLOUR 15,64,16,64
4370VDU23,230,255,128,128,128
,128,128,128,128
4380VDU23,231,255,0,0,0,0,0,0
,0
4390VDU23,232,255,1,1,1,1,1,1
,1
4400VDU23,233,128,128,128,255
,0,0,0,0
4410VDU23,234,0,0,0,255,0,0,0
,0
4420VDU23,235,1,1,1,255,0,0,0
,0
4430VDU23,236,24,40,78,128,78
,40,24,0
4440VDU23,237,48,40,228,2,228
,40,48,0
4450brick2$=CHR$230+CHR$231+C
HR$232+CHR$10+CHR$8+CHR$8+CHR$
8+CHR$233+CHR$234+CHR$235
4460PROCscreeninit
4470
4480REPEAT
4490REPEAT
4500MOUSE x%,y%,button%
4510UNTIL button%<>0
4520IF y%>308 THEN PROCprint_
brick
4530IF y%<167 AND y%>119 THEN
PROCcolour
4540IF y%>=32 AND y%<=64 THEN
4550VDU7
4560tx%=x% DIV 32
4570IF tx%>=2 AND tx%<7 THEN
PROCclear
4580IF tx%>=9 AND tx%<12 THEN
4590check=FNcheck:IF NOT chec
k THEN 4610
4600PROCstore_screen:PROCinit
ial_display:GOTO120
4610ENDIF
4620IF tx%>=14 AND tx%<22 THE
N PROCback
4630IF tx%>=24 AND tx%<32 THE
N PROCfor
4640IF tx%>=34 AND tx%<38 THE
N PROCsave
4650ENDIF
4660UNTIL 0
4670END
4680
4690DEFPROCscreeninit
4700*CHANNELVOICE 1 WaveSynth
-Beep
4710MOUSE RECTANGLE 0,0,1280,
1024
4720MOUSE STEP 1,1
4730MOUSE ON
4740*POINTER
4750VDU 5:GCOL 1
4760FOR lpy%=1023 TO 351 STEP
-48
4770FOR lpx%=64 TO 1120 STEP
96
4780MOVE lpx%,lpy%:PRINT bric
k2$
4790NEXT,
4800GCOL 15:RECTANGLE FILL 0,
0,1280,303
4810lpx%=88
4820FOR col%=0 TO 7:GCOL col%
4830MOVE lpx%,167:PRINT brick
$
4840lpx%+=144:NEXT:VDU4
4850COLOUR 3:PRINTTAB(2,30)"C
LEAR"TAB(9,30)"OUT"TAB(14,30)"
SCREEN ";CHR$236
4860PRINTTAB(24,30)"SCREEN ";
CHR$237;TAB(34,30)"SAVE"
4870PRINTTAB(14,24)" SCREEN
"
4880col%=4:scr%=1:COLOUR2
4890PRINTTAB(22,24);scr%;" "
4900PROCprint_screen
4910ENDPROC
4920
4930DEFPROCprint_brick
4940IF x%<68 OR x%>1214 THEN
ENDPROC
4950GCOL col%
4960X%=x%-((x%-64) MOD 96)+4
4970Y%=y%-((y%-20) MOD 48)
4980RECTANGLE FILL X%,Y%,86,3
6
4990changed%=TRUE
5000ENDPROC
5010
5020DEFPROCcolour
5030P%=POINT(x%,y%)
5040IF P%=15 THEN ENDPROC
5050col%=P%:SOUND 1,-12,(P%*1
0)+60,1
5060ENDPROC
5070
5080DEFPROCsave
5090check=FNcheck:IF NOT chec
k THEN ENDPROC
5100PROCstore_screen
5110OSCLI("SAVE screens "+STR
$~screen%+" +2711")
5120changed%=FALSE
5130ENDPROC
5140
5150DEFPROCstore_screen
5160count%=0
5170addr%=(scr%-1)*200
5180FOR lpy%=335 TO 1007 STEP
48
5190FOR lpx%=72 TO 1128 STEP
96
5200screen%?addr%=POINT(lpx%,
lpy%)
5210IF POINT(lpx%,lpy%)<>2 AN
D POINT(lpx%,lpy%)<>0 THEN cou
nt%+=1
5220addr%+=1:NEXT,
5230screen%?addr%=count%
5240ENDPROC
5250
5260DEFPROCprint_screen
5270addr%=(scr%-1)*200
5280FOR lpy%=303 TO 1023 STEP
48
5290FOR lpx%=64 TO 1120 STEP
96
5300col%=screen%?addr%
5310GCOL col%
5320RECTANGLE FILL lpx%+4,lpy
%+8,86,36
5330addr%+=1:NEXT,
5340ENDPROC
5350
5360DEFPROCfor
5370PROCstore_screen
5380scr%+=1:IF scr%>50 scr%=1
5390COLOUR 2:PRINTTAB(22,24);
scr%;" "
5400PROCprint_screen
5410ENDPROC
5420
5430DEFPROCback
5440PROCstore_screen
5450scr%-=1:IF scr%<1 scr%=50
5460COLOUR 2:PRINTTAB(22,24);
scr%;" "
5470PROCprint_screen
5480ENDPROC
5490
5500DEFPROCclear
5510check=FNcheck:IF NOT chec
k THEN VDU7:ENDPROC
5520FOR lp%=((scr%-1)*200) TO
(scr%-200)-1
5530screen%?lp%=0
5540NEXT
5550PROCprint_screen
5560ENDPROC
5570
5580DEFNcheck
5590MOVE 400,335:MOVE 900,500
:*SGET temp
5600VDU4:GCOL15:RECTANGLE FIL
L 400,335,500,165
5610COLOUR 143:COLOUR3
5620PRINTTAB(14,17)"Are you s
ure?"
5630COLOUR4:PRINTTAB(14,20)"Y
ES NO"
5640MOUSE RECTANGLE 400,335,5
00,165
5650REPEAT:REPEAT
5660MOUSE x%,y%,button%:UNTIL
button%<>0
5670x%=x% DIV 32:y%=(1023-y%)D
IV 32
5680UNTIL (y%=20 AND x%>=14 A
ND x%<=16) OR (y%=20 AND x%>=2
5 AND x%<=26)
5690*SCHOOSE temp
5700GCOL8,0:PLOT&ED,400,335:C
OLOUR128
5710MOUSE RECTANGLE 0,0,1280,
1024
5720IF (y%=20 AND x%>=14 AND
x%<=16) THEN =-1
5730=0

```


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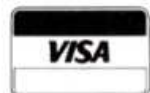
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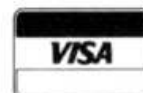
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KNOW THE SYSTEM

In a previous article, I reviewed System Delta's general database management system (DMS) from the viewpoint of the general non-programming user. I was generally impressed with the power and flexibility of the standard Card Index program, especially in view of the support utilities written by Minerva for report writing, exporting data to word processors, spreadsheets, graphics programs and so on. However, System Delta is fully programmable, so permitting users with the necessary skills to customise the interface or write additional utilities. It is to this aspect that the present article is directed and hence will, of necessity, be somewhat more technical in style than the earlier one. However, I will be presenting listings of utility programs of my own which may simply be typed in and used by System Delta owners who have no interest in understanding how they work. To make life simpler for different types of reader, I will document the use of the programs in a separate section from that in which I explain their workings.

At £19.95, the System Delta Reference Guide is on the pricey side. However, it generally does an excellent job of explaining the many facets of programming the ROM and frankly you won't have much chance of getting anywhere without it. Access to the ROM is entirely through * commands which are incorporated within BASIC programs. The manual - reasonably enough - presupposes knowledge of programming methods in general and BBC BASIC in particular.

File structure, commands and variables

All files created by use of the SD ROM have essentially the same structure. The various BASIC programs written to use the ROM determine the nature of the user interface and the types of manipulation which can be performed on the files and the data extracted from them. This means that utilities supplied by Minerva (Reporter, Mail Merge etc) and those presented in the listings at the end of this article can be applied to programs created by the customised database programs (Stock Control, Video Rental etc) as well as Card Index files. As mentioned in my previous

Jonathan Evans investigates the System Delta programming language and provides some useful new utilities for Delta owners

article, System Delta also allows multiple files to be open at the same time (within the limits of the DFS or ADFS) hence allowing relational database programming.

Another advantage of the common file structure is that you don't have to reinvent the wheel (or more specifically all the Card Index programs) when writing a customised interface. For example, you may wish to write an application which involves the use of two database files, each of which needs a field and card structure of a predetermined (though different) design. You could design the two card layouts using the Design Format of the Card Index red Create menu and save them as mini-files on your application disc. In order to create the files needed for a particular user you need only prompt for the maximum number of records required and then create each file by (i) issuing a command *SDofrom <formfile> to load the required format and (ii) using the command *SDcreate <filename> <length> to create the file.

The main named, ROM resident commands of System Delta are shown in Table 1. In addition to these there are several further commands which are available by loading a RAM extension from a disc file by SDext. These commands are, however, seldom used ones such as *SDcreate. The System Delta ROM also has a further 49 commands which are called by numbers - ie in the format *SDn. The numbered commands perform lower level

functions for both file and input handling. Examples of some of the more common and useful ones will be described later with reference to my utilities listing. Finally, Acorn have allocated Minerva the use of *FX163,16,p which performs various functions according to which third parameter p is issued.

The commands shown in Table 1 are really of a very high level, and make the design of professional looking programs very easy, as I discovered when writing my own utilities. For example, *SDgrec rec% will 'get' the record numbered rec% from the specified file (specification not needed if only one file is open). The command *SDscroll will then allow the user to scroll around the whole card within a window set by *SDwindow, with all the effects of cursor keys, Tab and Return familiar to Card Index users. This command even produces an automatic display of the X,Y co-ordinates and current field name at the top of the screen (see Figure 2).

Variables

In order to pass values back and forth from BASIC, System Delta makes use of variables, a list of which is shown in Table 2. By default some of the values are passed into resident integers - for example, N% will normally hold the number of the current record.

Resident integers are useful, of course, because their value is not lost when CHAINing between different BASIC programs. However, the values of all SD variables shown in Table 2 may be redirected by use of the command *SDvar to any numerical variable name of your own choice, either before or after opening the file (but after *SDreset).

Note that any non-resident integer variable must, however, be first given a value (eg recno%=0) or else a 'no such variable' error will occur. In addition, strings are passed via the memory location &A00 and may be read with the indirection operator \$. For example, to transfer the contents of field 5 of record 16 into a string variable you would need to issue as successive commands: *SDgrec 16, *SDgfield 5, field\$=\$&A00. Writing strings to the file is simpler, since these can generally be passed as arguments following the relevant *SD command.

C O N T I N U E S ►

SYSTEM DELTA UTILITIES by Jonathan Evans

```

O.  OPEN FILE          DEMO
E.  EXAMINE FIELDS DATA
S.  SELECT SUBSET I
B.  BLANK SUBSET
M.  BROWSE/MARK RECORDS
C.  CLOSE FILE
D.  REMOVE DELETED RECORDS
N.  NUMBERED PRINT OUT
*.  COMMAND LINE
  
```

You will also get 'no such variable' if you fail to initialise the system by *SDreset before attempting to open a file by *SDopen. The former command initialises the areas of the BBC memory used to hold system variables. While these are generally held below PAGE, other information read from the file on opening (eg sort pointers, see below) is stored high in memory by lowering HIMEM. Since the BASIC procedure stack is also stored in this region, certain SD commands cannot be issued from within a procedure (eg *SDopen, *SDclose, *SDext). If you require graphics modes, then the most memory hungry should be called at the outset and any subsequent mode changes performed by VDU22 which does not reset HIMEM. For most purposes, the system works best in Mode 7.

To open a file you issue *SDreset, followed by *SDopen <filename>. However, there are different options on opening the file. The default method reads all the 'sort pointers' associated with a file into memory but only accesses one disc record at a time. The sort pointers form an index table which contains the addresses of records. Although records are physically stored sequentially in order of entry, this order ceases to relate to record numbers once the file is sorted or compacted to remove deleted records. It is, however, the sort pointers, not the records that get moved about. Note here how important it is to close the file legally by *SDclose rather than by CLOSE 0 or Break. Information about the file held in memory - such as sort pointers - will not be written correctly back into the file unless you do.

Two variations on the standard opening method are allowed, though these only affect access and not the structure of the file itself. If both file and program are small and you have memory to spare, then you can specify that the program read a block of records into memory at once thereby speeding up access time and reducing disc reads as you browse your database. If program or database are large, you may not have room to read all the sort pointers into memory. In this case you can specify a 'disc based' file by *SDopen <filename> D. In this event only a 256 byte

buffer of sort pointers is held in memory. This has two consequences: (i) access to records by number may be slowed down and (ii) access by name of the key field will find the record required but not automatically find its record number (or updateN%). The reason for this second effect is that System Delta's very fast and effective key field search is achieved by

hashing to the physical location of the record, regardless of later sorting etc.

How easy is the system to program? Well, my first approach was to list out the Card Index programs and try to study them. This proved fairly hopeless since the variable and procedure names are compacted and the programs full of GOTOs and GOSUBs (necessary for error trapping, claims the Reference Guide). Also, the frequent reference to unintelligible *SDn commands made life harder. Having abandoned this approach, I decided on some utilities that I would like to add to the system and just started writing my own program. Each time I required access to the file, I looked up the appropriate commands in the manual and tried to implement them. After a slow beginning, I found that I quickly adjusted and even started throwing in plenty of my own unreadable numbered calls to boot! The resulting programs, listed here, provide more than simply a tutorial exercise - they add what I think are really useful extra facilities to the system (well I would, wouldn't I?). I will describe these for the general user prior to discussion of the programming methods.

Utilities program

The major program (Listing 1) is a set of menu

```

*SDadd file
*SDclose file
*SDcform file
*SDdefault rec% file
*SDdelrec rec% file
*SDdir dir% file
*SDdup locat% str% file
*SDedfield field file
*SDedrec rec% file
*SDext num%
*SDfile file
*SDfind str% file

*SDfstat file
*SDget
*SDgfield field file

*SDgline y% file
*SDgrec rec% file
*SDheight height% file
*SDkeys
*SDlform file
*SDnext file

*SDoform filename%
*SDopen filename% R D N

*SDopt options%....

*SDpaint x% y% file

*SDprint file
*SDpfield field file

*SDreset
*SDscroll x% y% file
*SDsform

*SDstat num%

*SDsubset sub% file

*SDtext str% x% y% file
*SDvar options%....
*SDview x% y% file
*SDwidth width% file
*SDwindow l% b% r% t% file

Add card to file
Close file (close all if ?)
Close alternative format
Enable/disable default card
Delete record
Set *SDnext direction
Key search or find duplicate
Edit field
Edit record
Enable/disable RAM utilities
Select primary file
Key field search for first card containing str%
List fields in file
Get character from keyboard
Get field from current record into %A00
Get line y% from card into %A00
Select record in file by number
Change height of card
Initialise COPY and cursor keys
Link alternative format to file
Select next record in file via *SDdir and the current subset
Open alternative format filename%
Open file on the current disc drive. R=number of records in RAM, D=Disc-based, M=No format in memory
Set the various system characteristics
Scroll card within window entering alphanumerics onto card
Produce ASCII dump of card
Place %A00 into field, formatting if numeric
Reset System variables
Scroll card in current window
Separate alternative format from file
Read status of file num% (If num%=List, list files open)
Select subset used by record accessing routines (0=entire file)
Place str% on card at (x%,y%)
Enable/disable/redirect variables
Display card within window
Change width of card
Set window size for file
  
```



```

X=016                                F004=titl
Y=005
SUBSET D                            MARKER SUBSET H
RECORD NUMBER 37                    UNMARKED

KEY 86111                            PAGES 04
DATE November 1986

Sketcha
=====
BASIC program for creating
line drawings and SPOOLing as
BASIC procedures

F - Forwards          B - Back
G - Goto record       Esc - Menu
M - mark rec          C - Clear rec
    
```

driven utilities for System Delta files. When run the program presents a main menu shown in Figure 1, which is operated in the standard System Delta manner - ie cursor keys will move a coloured bar to the desired option which may be chosen by Return, or the option may be selected directly by pressing the letter shown.

Escape is not used as a menu option and instead may be used to return to menu at any time. Your first actions should be to use the * command to choose drive and directory of your database file (if not at the location of the program) and then use option O to open the file. Once opened, the filename and current

subset will be displayed next to the relevant options on the menu. If you want to open a different file, then option O will automatically close the current one first. Otherwise option C must be used when finishing to close the file legally. This will also end the program, but you can type RUN if there is something you forgot to do! Option S can be used to change the subset, though you will not be allowed to choose an empty one that has no records in it.

Option E simply performs the *SDfstat command in a window, ie it shows you a list of field names and types associated with the current file. Field names can also be discovered by browsing cards in the file by option M. The first new utility provided is option B for blanking subsets. You can only do this in Card Index by entering a search criterion which will fail for every card. Option B allows you to either blank all subsets or just the currently selected one (returning you to option A - all cards). This may be needed in conjunction with , in which a subset of fields are printed across the line in columns. The card print option in Card Index does not include record numbers and there is nothing you can do to include them. You can put them into the list prints produced by Card Index's via its function table - though not I think, via the use of Simple Reporter. The Minerva documentation doesn't tell you explicitly how to do this. The trick is to include STR\$(N%) as part of the string definition.

Option N of my program gives you the choice of a numbered print out in either card or list print form. In either case you have the option of sending to printer or a SPOOLED disc file - the latter allowing further formatting via a word processor. The examples shown here are drawn from a database I set up of my own A&B articles, to avoid having to leaf through back issues every time I need a cross reference. Table 3 shows a card print of the details of a subset of Plus Talk articles that include reviews of commercial products. Table 4 shows a list of the dates and titles of articles about adventure games, again showing record numbers. Incidentally, the list print option does not use the complex Card Index method but simply asks for the fields numbers to be displayed in order, adding a blank space between each (retaining any spaces in the field data) before printing or spooling. It does print one line on the screen for you to examine before committing yourself to the use of your printer paper. Field numbers can be found by option E or scrolling the card via option M.

Option M provides the other major addition to Card Index, namely the ability to create a 'marker' subset. This allows you to create a subset on subjective criteria by marking or deleting cards on visual inspection. The cards are displayed in the form shown in Figure 2. The current card is shown in the central window and may be scrolled if this is too small to show the whole record. You may move forward and back through the selected subset (A for all cards) by use of the F and B keys (direct, not with Control) or else by Shift and cursor down/up as in Card Index if you

Variables Updated By System Delta

system variable	purpose	default integer
01	file status	S%
02	file handle	H%
03	key pressed/byte peeked etc.	G%
04	menu option selected	O%
05	height of card	(Dh)
06	width of card	(Dw)
07	number of fields	(Df)
08	sort field number	(Dsort)
09	key search field number	(Dkey)
10	last field accessed	
11	current subset	(Dsub)
12	cursor X co-ordinate	(Dx)
13	cursor Y co-ordinate	(Dy)
14	disc location of record	(Dlocat)
15	record number (current record)	D%
16	max number of records on file	(Drecs)
17	number of records used	(Dopen)
18	memory location of file info	R%
19	bytes of workspace	(Dwsb)
20	characters on card	(Dfb)
21	workspace pointer - WSPTR	(Dwsp)
22	EXT# file	(Dext)

Variable 01 (S%) will return zero if no System Delta files are open, and 1 if a file/format is open for creation or modification. If files are open for access the value returned will be two times the number of files open.

Variable 03 (G%) will usually be the 'character last pressed' as in *SDscroll but sometimes it may be used to return 'requested' values, eg. *SD30.

Variable 04 (O%) the option selected, is only set by *SD10.

Variable 08 is reserved for use with the System Delta Extension RDM and is inapplicable to the standard System Delta.

C O N T I N U E S ►

Table 3

RECORD NUMBER 29 =====		RECORD NUMBER 45 =====	
KEY 86082	PAGES 03	KEY 87031	PAGES 02
DATE August 1986		DATE March 1987	
Plus Talk		Plus Talk	
=====		=====	
Mail merging advice. Reviews of IPBL SXR, Word Plus and Word Processing Magazine		Review of Pen Friend 2 (WP magazine) and listing of WSEARCH	
=====		=====	
RECORD NUMBER 18 =====		RECORD NUMBER 38 =====	
KEY 86011	PAGES 04	KEY 86112	PAGES 05
DATE January 1986		DATE November 1986	
Plus Talk		Plus Talk	
=====		=====	
Review of major utilities packages: Wordease, Wordaid, CP ROM, W+ PROG IDEAS, USERS G		Review of Complete Wordwise + Handbook, WordPro and Inter-Word	
=====		=====	
RECORD NUMBER 52 =====			
KEY 87083	PAGES 04		
DATE August 1987			
Plus Talk			
=====		=====	
		Discussion of Spell Master including BASIC "CHECKER" and WW+ seg prog "LEXICON"	
		=====	

prefer. The cards are chosen from the currently selected subset which is shown in the top left corner.

Pressing 'G' will allow you to go to a record (similar to Control-F in Card Index). You are prompted to enter the card name which can be a minimum of the first three letters of the key field (ignoring spaces and punctuation) or else the rn difficult to choose a subset on purely objective criteria, because you may need knowledge not in the database or not there in a clearly defined manner. Suppose, for example, you have a database of names and addresses of friends and acquaintances and want to mount a selective mail shot for your Christmas cards. You are hardly likely to base your choice on what town they live in, or the initial letter of their name! You may, of course, narrow the search first by using an objective subset search.

For example, Table 3 was produced by first choosing a subset of Plus Talk articles within Card Index by string search of the title field. I then CHAINED the current program and opened the file with this as the selected subset. I then specified a different letter for the marker subset, checking first that it was blank, and marked all those containing review material (as opposed to just utilities) by inspection of the comment fields. Similarly, the adventure article list shown in Table 4 was selected by browsing the whole database, since the term 'adventure' does not occur in all titles.

A couple of further points should be made about the use of the marker subset option. Firstly, you may or may not wish to blank the marker subset by option B before use. If you don't, then any new cards marked will be added to anything already in the subset. Secondly, the program will allow you to set the marked subset to the same letter as the currently

selected subset. In this case, of course, all records browsed will initially be shown as 'marked'. If you clear any, you will be moved to the next card in the subset (or the previous one if it is the last). This may be useful when an objective search is overinclusive, ie chooses a subset with a few cards not actually needed.

Interfacing with text files

I must here apologise to Minerva for an inaccurate criticism of their Mail Merge utility in my previous article. I stated that their programs did not allow one to run mail shots where the data extracted from the Delta file exceeded the memory capacity of the machine. In fact, this does not appear to be true in the case of the Wordwise Plus link. The text file extracted is spooled and hence may be of any length. Having examined the Wordwise Plus segment program I now see that my assumption that the whole of the SPOOLED file was read into memory at once was in error. The program actually reads one record at a time which is deleted before the next. So far as I can see, this should mean that the mail shot will be limited only by the space available on the filing system for holding the spooled file.

What Minerva have not provided, however, is a utility for transferring data in the other direction, ie from a text file into a System Delta file. This may be useful for two main reasons: (a) you may be holding a database in a wordprocessor, especially Wordwise Plus which allows simple sorts etc, but find this to have become hard to manage and slow to sort. Since you now have System Delta you would prefer to transfer the data into its much more

powerful database environment; (b) you may have data held in an inferior database program which you wish to transfer to System Delta. You cannot do this directly since your old system is not programmable, but it does have a facility for spooling the records into an ASCII file on disc.

The program shown in Listing 2 transfers data from a text or spooled file into an existing System Delta file. The latter may, of course, have been created specially for the purpose and be initially empty.

When the program is run you are prompted to enter the names of both the Delta and text files concerned and the rest happens automatically.

You will, however, have to edit two lines of the program as listed. AT line 570, set fields% equal to the number of fields to be transferred. The DATA statement at line 620 should then hold the numbers of the fields in the Delta file to which each successive line should be transferred. Note that these need not be in sequence and can be a subset only of the Delta file. The program requires at least one carriage return to mark the end of a field in the text file but will ignore others (eg between records) and line feed characters produced by spooling. Note also that any string which is over the length allowed in the Delta field will automatically be truncated.

Workings of the programs

OK, you non-programmers can now go off and delve into the Arcade or read Jon Vogler's latest assessment of dot matrix printers. For anyone still reading, here are some notes on the main program sections of Listing 1 with

Table 4

(09)	July	1985	Assassin
(10)	July	1985	Adventurescape
(15)	November	1985	Amnesia
(20)	March	1986	All action adventures
(24)	May	1986	Adventurescape III
(25)	June	1986	Adventurescape III - tutorial
(27)	July	1986	Adventurescape III - Utilities
(32)	Sept'ber	1986	Adventure Challenge
(33)	Sept'ber	1986	Adventurescape Help
(41)	January	1987	Adventurously Yours
(49)	June	1987	Adventure Roundup

particular attention to the use of SD commands.

Main program. The GOSUBs from main program level are needed for the first and seventh menu options because they contain commands affecting HIMEM.

PROCinit. menu\$ is set to a string for use with the System Delta menu facility (see below). Line 200 defines sub% as the variable that will automatically be assigned the number of the current subset.

PROCmenu. The System Delta menu operation is set up by (a) having options on successive lines, (b) printing three characters at the start of the menu line first selected (in this case teletext control codes) and (c) calling *SD10 with the number of the first line chosen and a string containing each menu character in sequence.

Brilliant! **PROCaction.** Calls procedures according to menu option selected.

*SD07 executes a * command in a window - as simple as that.

Subroutine for opening file. *SD08 prints a prompt on the bottom line and accepts input of the length specified by the second parameter, with SD editing facilities. Line 560 opens the file (*SD48 equivalent to OSCLI). However, variables can be passed with *SD commands, ie *SDopen file\$ would work. *SD45 N disables errors due to failure to find record by key field search, but allows user to trap by setting G% to 0 or 255 to indicate success/failure.

FNfields. *SDfstat displays field information, but does not define its own window, hence preceded by PROCwindow. *SD06 prints "press a key" at the bottom of the screen and waits for press.

PROCwindow. Sets text window which preserves header.

PROCsubset. *SD03 displays string passed at bottom of screen.

*SD05 gets an ASCII code of character pressed, converting to upper case. *SDsubset

selects subset.

FNfirstrec. How to find the first record of a subset without knowing its number. *SDdir sets direction of *SDnext for forward movement. *SDgrec 0 gets 'record 0' which is actually the blank card.

Then *SDnext selects the 'next' (ie first) card in the subset (this command automatically skips cards deleted or not in current subset).

If one attempts to read beyond the end of the current subset, N% is set to 65280 or 65281 (according to direction of search) instead of the current record number. This is checked at line 950 since it could only indicate an empty subset in this case.

FNopen. Used at the start of most procedures called from menu options to check that a file is open.

PROCbeep. The *FX command is a System Delta special which produces the beep sounded on system errors etc.

Subroutine for compacting file. *SD numbered commands for input/output except: *SDext 2 which loads extension 2 (RAM based commands); *SDcompact, and *SDextoff to reclaim memory.

PROCblank. The eight subsets are stored as a single byte in each record in which a bit set means that a record is clear, otherwise is a member of the subset 1-8 for bits 0-7. A bit mask controlled by *SD37 can restrict read write access to one subset at a time. *SD37 0 permits access to whole byte. The loop from line 340 - 360 includes the command *SD35 rec% which checks status of the card, setting G% to 0 if a member of current subset. In this case PROCpoke is called to clear subset. The latter procedure gets subset byte into G% by *SD33, ORs it with the appropriate bit pattern and writes it back with *SD34.

A simpler method for operating on single subsets is used in PROCs mark and clear (see below).

PROCblankall. Writes 255 into all subset bytes hence clearing all subsets.

PROCpoke. See PROCblank above.

ON ERROR ROUTINE. Escape returns directly to menu. Otherwise error is printed in window, and user returned to menu after a key press. Routine cancels paging mode, printer and closes SPOOL file just in case!

PROCbrowse. *SDwindow sets up scroll area. *SDscroll not only allows scroll with reprogramming of cursor, RETURN and TAB keys but also returns ASCII code of any other key pressed as it releases scroll mode. Note also that System Delta provides ASCII codes in G% for Shift and cursor key presses (not normally available in BASIC) which are used at lines 1850-1870. Normally, exit from PROCbrowse is by pressing Escape and going via ON ERROR routine. However, "empty" becomes true if the marker subset is the currently selected one also and the user deletes every record! **FNstr.** Converts record number to a string with 0's added to the beginning as necessary. Note that R% contains record number of highest record number used, and so is used to set required length of the string.

PROCforward. Moves to next record forward in the file, but retains old record number and restores it if this results in a move beyond the end of the subset (ie old record is the last record).

PROCback. Similar to above for moving backwards. *SDdir 0 sets the direction of movement backwards for *SDnext. N% is set to big number when attempt is made to read beyond the beginning of the file.

FNmark. Called at the start of PROCbrowse to allow marker option to be set. Uses *SD numbered commands for input/output.

PROCpanel. Prints panel of key presses at bottom of browse screen.

PROCgoto. Takes user's input for 'Goto card' when browsing. If first character is then PROCgotono is called. Otherwise key field search is conducted by *SDfind returning non-

C O N T I N U E S ►

zero value in G% if no record is found.

PROCgotono. Extracts number of card entered and places in recno%. If within range (1 to R%) then selects record number by *SDgrec. *SD35 then checks if this record is actually in current subset. If not it moves to next record, but this might not exist in which case it moves to previous record. Phew!

FNoutofrange. If out of range calls FNbig or FNzero according to which end. FNzero complains and does nothing else, whereas FNbig sets record to last in the subset.

FNzero, FNbig. See above.

FNinsub. *SD37 is used to set bit mask to read/write subset specified. Then *SD33 will return 0 if and only if record specified is in subset.

PROCmarkhead. Prints marker status of record on screen.

PROCmark. Marks a record the easy way, by setting bit mask and then entering 0 value via *SD34.

PROCclear. Similar to above but enters 1 to clear record.

PROCnextrec. Called by PROCclear only when the marker subset is also the current one. Finds next available record in forward direction if it exists, otherwise finds the previous one.

PROCnumprint. Called by the number print option. If list printing required calls PROClistprint and exits. Otherwise executes card print by looping through current subset and issuing the command *SDprint.

PROCsetup. Sets up printer or disc output options for both card and list print options.

PROCsetprint. Self evident.

PROClistprint. Executes list print after eliciting user's options for fields. Note that the REPEAT.UNTIL loop (lines 3520-3560) quits only after reading beyond the current set of records (no WHILE loop in BBC BASIC). Line 3580 resets record to last of current subset.

FNline. Composes string for line printing, using *SDgfield to get contents of required fields according to numbers entered by the user.

Listing 2 makes use of a couple of SD commands not demonstrated in Listing 1. These are *SDadd (line 690) for adding a new record to a file and *SDpfield (line 750) which puts a string held at &A00 into the field specified.

Factfile

System Delta with Card Index is available from Minerva Systems, 69 Sidwell Street, Exeter, Devon EX4 6PH priced £4.95. The programmers' reference manual is an extra £19.95.

The programs in this article have been listed using the A&B Computing Checker. The four digit hexadecimal number in brackets at the end of each line is the "checksum" for that line. It is not to be typed in.

With Checker installed, each program line is assigned a unique checksum when RETURN is pressed to enter that line. Compare the checksum number on your screen with that in the magazine to be certain that a line has been correctly entered.

Checker is published periodically in A&B and featured on most Software Sale discs.

◆ LISTING 1 ◆

```

10REM System Delta Utilities
(F774)
20REM Jonathan Evans (4BA0)
30: (10FF)
40MODE7:CLOSE#0:*SDreset (9
6A0)
50ON ERROR GOTO 1590 (6EA5)
60PROCinit (F7CC)
70REPEAT (130B)
80PROCmenu (43D5)
90IF O%=1 THEN GOSUB 520 (1
059)
100IF O%=7 THEN GOSUB 1120 (
C41A)
110PROCaction (8BFA)
120UNTIL finished (9CEA)
130*SDclose (5891)
140CLS:END (46F2)
150: (2659)
160DEFPROCinit (C5C0)
170finished=FALSE:file$="" :s
ub$="" :buffer=&A00 (C90B)
180menu$="OESBMCDN":nextopt
%=1 (9957)
190DIM field%(10) (0370)
200sub%=0:*SDvar 11,sub% (AC
C5)
210ENDPROC (3B0A)
220: (8415)
230DEFPROCmenu:VDU26,12 (8F7
0)
240IF nextopt%<>99 THEN O%=n
extopt% (9CF3)
250FOR I%=1TO2:VDU141,132,15
7,131:PRINT SPC5;"SYSTEM DELTA
UTILITIES":NEXT I% (9ADD)
260VDU 32,132,157,131:PRINT
SPC8;"by Jonathan Evans" (0F45
)
270PRINT TAB(4,8);"O. OPEN
FILE ";CHR#133;file$ (24AE)
280PRINT TAB(4,9);"E. EXAMI
NE FIELDS DATA" (BAC3)
290PRINT TAB(4,10);"S. SELE
CT SUBSET";CHR#133;sub$ (8356)
300PRINT TAB(4,11);"B. BLAN
K SUBSET" (B6C9)
310PRINT TAB(4,12);"M. BROW
SE/MARK RECORDS" (3546)
320PRINT TAB(4,13);"C. CLOS
E FILE" (BBAD)
330PRINT TAB(4,14);"D. REMO
VE DELETED RECORDS" (452A)
340PRINT TAB(4,15);"N. NUMB
ERED PRINT OUT" (0B9F)
350PRINT TAB(4,16);"*. COMM
AND LINE" (DE85)
360PRINT TAB(0,7+O%);CHR#135
;CHR#157;CHR#129; (4753)
370*SD10 O%,menu$ (F75B)
380nextopt%=99 (89D9)
390ENDPROC (C36C)
400: (2E4B)
410DEFPROCaction (A05E)
420IF O%=2 THEN PROCfields (
F24D)
430IF O%=3 THEN PROCsubset (
7B3D)
440IF O%=4 THEN PROCblank (6
14E)
450IF O%=5 THEN PROCbrowse (
CCE7)
460IF O%=6 THEN finished=TRU
E (DCA6)
470IF O%=8 THEN PROCnumprint
(ABBF)

```

```

480IF O%=9 THEN *SD07 (4739)
490ENDPROC (AAA1)
500: (2A7E)
510REM SUBROUTINE FOR OPENIN
G FILE (1A62)
520*SD08 "Filename ",7 (1F69
)
530temp$=buffer (4629)
540file$="" :sub%=0:sub$="" (
7E04)
550*SDclose (A2CD)
560A$=*SDopen "+temp$:*SD48
A$ (0334)
570*SD45 N (B094)
580file$=temp$ (A6D6)
590sub$=CHR$(sub%+65) (887E)
600nextopt%=3 (0E87)
610IF NOT FNfirstrec THEN PR
OCsubset (3031)
620RETURN (6DA0)
630: (CDB1)
640DEFPROCfields (2AE4)
650IF NOT FNopen ENDPROC (89
04)
660PROCwindow:CLS (9FE2)
670*SDfstat (6271)
680*SD06 (D566)
690ENDPROC (E152)
700: (2214)
710DEFPROCwindow (1740)
720VDU28,0,24,39,4 (8E6D)
730ENDPROC (9A7A)
740: (6797)
750DEFPROCsubset (69C7)
760IF NOT FNopen ENDPROC (A5
9C)
770REPEAT (7AFA)
780string$="Choose subset (A
-1): " (04ED)
790*SD03 string$ (CD6D)
800REPEAT (53F3)
810*SD05 (DC53)
820UNTIL G%>64 AND G%<74 (CF
A7)
830PRINT CHR$ G%; (4A4A)
840sub%=G%-65 (4EB3)
850*SDsubset sub% (22F0)
860sub$=CHR$(sub%+65) (7D6E)
870UNTIL FNfirstrec (6177)
880ENDPROC (736F)
890: (CD41)
900DEFNfirstrec (78EC)
910REM Finds first record of
selected subset (4FDF)
920*SDdir (8492)
930*SDgrec 0 (CDB4)
940*SDnext (6CD0)
950IF N%<65280 THEN =TRUE (7
329)
960PROCwindow:CLS (9924)
970PRINT"" No records in
subset ";sub$ (05D6)
980*SD06 (A2D1)
990=FALSE (BEDE)
1000: (8C71)
1010DEFNopen (2E72)
1020IF file$<>"" THEN =TRUE (
23E8)
1030PROCbeep:*SD03 "No file o
pen" (6BD6)
1040wait=INKEY(200) (5803)
1050nextopt%=1 (CB4E)
1060=FALSE (518A)
1070: (2262)
1080DEFPROCbeep (2DC2)
1090*FX163,16,38 (531B)
1100ENDPROC (DE0A)
1110: (D134)
1120REM SUBROUTINE FOR COMPAC
TING FILE (3E82)
1130IF NOT FNopen THEN RETURN
(599C)

```



```

1140*SD09 "Sure (Y/N) ?" (4CF
5)
1150IF CHR$G% <> "Y" THEN RET
URN (9D9B)
1160*SD03 "Loading extension"
(4C00)
1170*SDext 2 (70EF)
1180*SD03 "Compacting file" (
4A39)
1190*SDcompact (D000)
1200*SDext off (FC1C)
1210RETURN (249F)
1220: (36FB)
1230DEFPROCblank (7CD0)
1240IF NOT FNopen THEN ENDPRO
C (6090)
1250*SD09 "Blank all subsets
(Y/N) ?" (6FB1)
1260IF CHR$G% = "Y" THEN PROC
blankall:ENDPROC (1B49)
1270IF sub%=0 ENDPROC (678B)
1280string$="Blank selected s
ubset "+sub$+" (Y/N) ?" (4734)
1290*SD09 string$ (0905)
1300IF CHR$G% <> "Y" THEN END
PROC (DEFE)
1310*SD03 "Please wait" (8A6A
)
1320*SD37 0 (E38E)
1330bit%=2^(sub%-1) (430B)
1340FOR rec%=1 TO R% (4089)
1350*SD35 rec% (92A6)
1360IF G%=0 THEN PROCpoke (4D
48)
1370NEXT (4459)
1380sub%=0:sub$="A":*SDsubset
0 (8543)
1390ENDPROC (99E0)
1400: (9CA5)
1410DEFPROCblankall (FD2A)
1420*SD03 "Please wait" (1EBF
)
1430sub%=0:sub$="A" (A03B)
1440*SDsubset 0 (62E4)
1450*SD37 0 (6E75)
1460FOR rec%=1 TO R% (A4B0)
1470*SDgrec rec% (36FD)
1480*SD34 255,rec% (C2EA)
1490NEXT (AF35)
1500ENDPROC (49EC)
1510: (C1E0)
1520DEFPROCpoke (2258)
1530*SD33 rec% (7AB0)
1540G%=G% OR bit% (FF6D)
1550*SD34 G%,rec% (C680)
1560ENDPROC (EC7D)
1570: (36B3)
1580REM ON ERROR ROUTINE (DB9
5)
1590VDU3,15:*SPOOL (5A1B)
1600IF ERR=17 THEN GOTO 70 (7
095)
1610PROCwindow:CLS (34D7)
1620PRINT "" (05FF)
1630PROCbeep (7493)
1640REPORT (163B)
1650PRINT " at line ";ERL (3A
2C)
1660*SD06 (69D8)
1670GOTO 70 (9EBF)
1680: (1FC9)
1690DEFPROCbrowse (93EE)
1700empty=FALSE (E947)
1710IF NOT FNopen ENDPROC (AS
77)
1720marking= FNmark (ACE)
1730CLS (A762)
1740*SDwindow 0,19,38,6 (67B6
)
1750browsing=TRUE (B0DD)
1760FOR I%=1 TO 3:PRINT CHR$1
29;CHR$157;CHR$135:NEXT (F1B1)
1770PRINT TAB(3,2);"SUBSET ";

```

```

sub$::IF marking PRINT SPC12;"
MARKER SUBSET ";marksub$ (0422
)
1780PROCpanel (C748)
1790REPEAT (CF41)
1800REPEAT (C709)
1810PRINT TAB(0,4);CHR$134;"R
ECORD NUMBER ";FNstr(N%); (7FB
0)
1820IF marking THEN PROCmarkh
ead (8A71)
1830*SDscroll (1884)
1840G%=CHR$G% (4BDA)
1850UNTIL INSTR(key$,G%) OR G
%=142 OR G%=143 (4542)
1860IF INSTR("Ff",G%) OR G%=1
42 THEN PROCforward (1B2D)
1870IF INSTR("Bb",G%) OR G%=1
43 THEN PROCback (D030)
1880IF INSTR("Mm",G%) THEN PR
OCmark (CD07)
1890IF INSTR("Cc",G%) THEN PR
OCclear (E6E9)
1900IF INSTR("Gg",G%) THEN PR
OCgoto (12D5)
1910UNTIL empty (274E)
1920IF empty THEN sub%=0:sub$
="A":*SDsubset 0 (F3D4)
1930ENDPROC (136C)
1940: (EC6F)
1950DEFFNstr(no%) (DA2B)
1960len%=LEN(STR$(R%)) (311C)
1970rec%=STR$(no%) (BEB1)
1980IF LEN(rec%)=len% THEN =r
ec$ (F248)
1990rec$=STRING$(len%-LEN(rec
$),"0")+rec$ (F8B4)
2000=rec$ (3DC2)
2010: (2956)
2020DEFPROCforward (0BA4)
2030oldrec%=N% (8BB2)
2040*SDdir (342D)
2050*SDnext (9F0A)
2060IF N%>R% THEN *SDgrec old
rec% (DD18)
2070ENDPROC (DD42)
2080: (FB20)
2090DEFPROCback (85FB)
2100oldrec%=N% (6199)
2110*SDdir 0 (78DD)
2120*SDnext (CEE4)
2130IF N%>65279 THEN *SDgrec
oldrec% (0238)
2140ENDPROC (AA73)
2150: (68E0)
2160DEFFNmark (B44A)
2170*SD09 "Create marker subs
et (Y/N) ?" (7C2B)
2180G%=CHR$G% (3B15)
2190IF G%="N" THEN key$="FfBb
MmGg":=FALSE (A113)
2200*SD03 "Enter marker subse
t (B-I) "; (2ACB)
2210REPEAT (A124)
2220*SD02 (11EF)
2230UNTIL G%>65 AND G%<74 (A6
46)
2240marksub%=G%-65:marksub$=C
HR$G% (DC5B)
2250key$="FfBbMmGgMmCc":=TRUE
(479E)
2260: (BF2F)
2270DEFPROCpanel (791F)
2280PRINT TAB(0,20);CHR$129;C
HR$157;CHR$135;" F - Forwards
B - Back" (B997)
2290PRINT CHR$129;CHR$157;CHR
$135;" G - Goto record Esc
- Menu" (ABF4)
2300IF marking PRINT CHR$129;
CHR$157;CHR$135;" M - mark rec
C - Clear rec" (04D1)
2310ENDPROC (86F8)

```

```

2320: (CE99)
2330DEFPROCgoto (864B)
2340*SD08 "Find which card: "
,10 (D2DF)
2350card$=buffer (E89B)
2360IF LEFT$(card$,1)="# " THE
N PROCgoto:ENDPROC (629B)
2370*SDfind card$ (CB5C)
2380IF G%=0 ENDPROC (4340)
2390PROCbeep:*SD03 "Not found
" (6D3B)
2400wait=INKEY 200:*SD03 " "
(D7E4)
2410ENDPROC (EF35)
2420: (D212)
2430DEFPROCgoto (FBEA)
2440recno%=VAL(RIGHT$(card$,L
EN(card$)-1)) (4BCD)
2450IF FNoutofrange ENDPROC (
1D3B)
2460*SDgrec recno% (BF06)
2470*SD35 recno% (1EBB)
2480IF G%<>0 THEN OSCLI("SDdi
r"):OSCLI("SDnext") (1714)
2490IF N%>65279 THEN OSCLI("S
Ddir 0"):OSCLI("SDnext") (BFE4
)
2500ENDPROC (1B4A)
2510: (3DB7)
2520DEFFNoutofrange (55FA)
2530IF recno%>0 AND recno%<=R
% THEN =FALSE (879E)
2540IF recno%<1 THEN =FNzero
ELSE =FNbig (07F6)
2550: (7834)
2560DEFFNzero:PROCbeep:*SD03
"Out of range" (566D)
2570wait=INKEY 200:*SD03 " "
(1C5B)
2580=TRUE (9202)
2590: (B6B1)
2600DEFFNbig:*SDgrec R% (7923
)
2610*SD35 (8D6C)
2620IF G%<>0 THEN OSCLI("SDdi
r 0"):OSCLI("SDnext") (0D27)
2630=TRUE (91AC)
2640: (2D1B)
2650DEFFNinsub(rec%,subset%)
(BAF4)
2660REM Checks if record in s
ubset which need not be curren
tly selected (7BA3)
2670*SD37 subset% (89BD)
2680*SD33 rec% (E4BC)
2690IF G%=0 THEN =TRUE ELSE =
FALSE (8547)
2700: (6CAD)
2710DEFPROCmarkhead (0FCC)
2720IF FNinsub(N%,marksub%) T
HEN h$="MARKED" ELSE h$="UNM
ARKED" (C63F)
2730PRINT CHR$131;SPC4;h$ (15
B1)
2740ENDPROC (7666)
2750: (705E)
2760DEFPROCmark (C5EA)
2770*SD37 marksub% (1DAF)
2780*SD34 1,N% (5457)
2790ENDPROC (5CA0)
2800: (518E)
2810DEFPROCclear (530F)
2820*SD37 marksub% (B2B5)
2830*SD34 0,N% (2303)
2840IF sub%=marksub% THEN PRO
Cnextrec (1B55)
2850ENDPROC (5183)
2860: (A6ED)
2870DEFPROCnextrec (975F)
2880*SDdir (F53E)

```

C O N T I N U E S ►


```

2890*SDnext (FBE4)
2900IF N%<65280 THEN ENDPROC
(BE3C)
2910*SDdir 0 (344F)
2920*SDnext (C16B)
2930IF N%>65279 THEN empty=TR
UE (22EC)
2940ENDPROC (A5FC)
2950: (494B)
2960DEFPROCnumprint (9CAF)
2970IF NOT FOpen ENDPROC (56
FB)
2980PROCwindow:CLS (C76D)
2990PRINT "Card print or list
print (C/L) ?"; (0E4F)
3000REPEAT:G$=GET$:UNTIL INST
R("Ccl",G$) (F79D)
3010PRINT " ";G$ (A54F)
3020IF INSTR("Ll",G$) THEN PR
OClistprint:ENDPROC (5D4B)
3030PROCsetup (BA6D)
3040*SDgrec 0 (2A14)
3050REPEAT (EC29)
3060*SDnext (0C40)
3070IF N%>65279 THEN 3110 (06
2E)
3080PRINT "RECORD NUMBER ";F
Nstr(N%) (6715)
3090PRINT STRING$(14+1en%,"="
)' (F9BF)
3100*SDprint (3D04)
3110UNTIL N%>65279 (BF76)
3120*SPOOL (9162)
3130OSCLI("SDgrec 0"):OSCLI("
SDnext") (30CE)
3140VDU3:PRINT":*SD06 (B10F)
3150ENDPROC (3A77)
3160: (377C)
3170DEFPROCsetup (6A9F)
3180PRINT "Output to printer
or disc file (P/D) ? "; (A80B)
3190REPEAT:G$=GET$:UNTIL INST
R("PpDd",G$) (23B2)
3200IF INSTR("Pp",G$) THEN PR
OCsetprint:ENDPROC (F2BF)
3210*SD08 "Name of disc file:
",7 (1FE0)
3220CLS:OSCLI("SPOOL "+$buffe
r) (BFA3)
3230ENDPROC (61CD)
3240: (89C3)
3250DEFPROCsetprint (FB14)
3260PRINT "Set up printer a
nd press any key" (66DC)
3270*FX15,1 (CC5C)
3280REPEAT UNTIL GET (343F)
3290CLS:VDU2 (D24B)
3300ENDPROC (16FC)
3310: (9105)
3320DEFPROClistprint (EAA4)
3330REPEAT (FBB7)
3340CLS:PRINT "Enter field nu
mbers (1 - ";F%";) (4B60)
3350PRINT "in sequence to be p
rinted" (0 to finish)" (DF2A
)
3360f%=0 (7A6F)
3370REPEAT:f%=f%+1 (B3CA)
3380REPEAT (F49B)
3390PRINT "Field ";f%"; " ";:INP
UT " " g% (12BF)
3400IF g%>F% THEN PROCbeep (9
5B7)
3410UNTIL g%>=0 AND g%<=F% (C
5C2)
3420IF g%>0 THEN field%(f%)=g
% ELSE f%=f%-1 (BF7D)
3430UNTIL g%=0 OR f%=10 (D92E
)
3440PRINT "Example from curre
nt record:" (9F42)
3450PRINT FLine (6E13)
3460PRINT "OK to proceed (Y/N

```

```

) ? "; (EBB6)
3470REPEAT:G$=GET$:UNTIL INST
R("YyNn",G$) (20B0)
3480UNTIL INSTR("Yy",G$) (1B1
E)
3490PRINT G$ (1AD9)
3500PROCsetup (7975)
3510*SDgrec 0 (4C40)
3520REPEAT (0B00)
3530*SDnext (C906)
3540IF N%>65279 THEN 3560 (13
92)
3550PRINT FLine (4B46)
3560UNTIL N%>65279 (B1CB)
3570PRINT:*SPOOL (7D5F)
3580OSCLI("SDgrec 0"):OSCLI("
SDnext") (0EF0)
3590VDU3:PRINT":*SD06 (F74B)
3600ENDPROC (34C2)
3610: (B5E4)
3620DEFFNline (CB24)
3630L$="("+FNstr(N%)+") " (B
C1B)
3640FOR i%=1 TO f% (F2BE)
3650fi%=field%(i) (4B81)
3660*SDgfield fi% (A932)
3670L$=L$+$buffer+" " (B01D)
3680NEXT i% (DE0B)
3690=L$ (9AF3)
3700: (DBA1)

```

◆ LISTING 2 ◆

```

10REM System Delta text fil
e converter (DAD5)
20REM Jonathan Evans (4BA0)
30: (10FF)
40ON ERROR GOTO 410 (2159)
50PROCinit (09E7)
60MODE7:CLOSE#0:*SDreset (2
313)
70PROCheader (89AE)
80PROCinstructions (64CB)
90GOSUB 240 (7E35)
100PROCopentext (EE55)
110PROCcinit (547F)
120*SD06 (6570)
130*SDclose (5B91)
140CLOSE#0 (29C7)
150VDU26,12:END (BD33)
160: (CDC9)
170: (94B9)
180DEFPROCheader:VDU26,12 (4
B6C)
190FOR I%=1TO2:VDU141,132,15
7,131:PRINT SPC5;"SYSTEM DELTA
TEXT READER":NEXT I% (C75E)
200VDU32,132,157,131:PRINT S
PCB;"by Jonathan Evans" (C701)
210PROCwindow (3201)
220ENDPROC (F9E3)
230: (DD65)
240REM SUBROUTINE FOR OPENIN

```

The programs in this article have been listed using the A&B Computing Checker. The four digit hexadecimal number in brackets at the end of each line is the "checksum" for that line. It is **not** to be typed in.

With Checker installed, each program line is assigned a unique checksum when RETURN is pressed to enter that line. Compare the checksum number on your screen with that in the magazine to be certain that a line has been correctly entered.

Checker is published periodically in A&B, featured on most Software Sale discs and is available on disc, price 1 (20p p&p). Cheques made payable to Phoenix software.

```

G FILE (9BF0)
250*SD08 "System Delta filen
ame ",7 (2501)
260file$=$&A00 (361B)
270*SDopen file$ (6029)
280*SDsubset 0 (3CD8)
290RETURN (4753)
300: (32C0)
310DEFPROCwindow (C3BF)
320VDU28,0,24,39,4 (6C54)
330ENDPROC (0D9C)
340: (7743)
350DEFPROCinstructions (651F
)
360PRINT (30FD)
370PRINT "This program reads
data from a text""file and pl
aces it into an existing""Sys
tem Delta file." (F5DA)
380PRINT "Fields in the text
file should be""separated by
at least one ""carriage retu
rn." (2BBC)
390*SD06 (302B)
400ENDPROC (A6B8)
410: (773B)
420REM ON ERROR ROUTINE (609
1)
430*SDclose (AF7B)
440CLOSE#0 (0BF9)
450CLS:PRINT (3C1A)
460REPORT (AC63)
470PRINT " at line ";ERL (85
97)
480END (7937)
490: (FC3D)
500DEFPROCopentext (D874)
510*SD08 "Text filename ",7
(BF10)
520tfile$=$&A00 (92A5)
530tf%=OPENIN(tfile$) (EBB5)
540ENDPROC (35BF)
550: (368D)
560DEFPROCcinit (10E7)
570nfields%=4 (A7B4)
580DIM fields%(nfields%) (96
C4)
590FOR i=1 TO nfields% (513B
)
600READ fields%(i) (8E5F)
610NEXT (34B7)
620DATA 1,2,3,4 (D9FF)
630ENDPROC (2FA2)
640: (63A2)
650DEFPROCtransfer (1CC7)
660PROCwindow:CLS (9FE2)
670REPEAT (3B5D)
680IF EOF#tf% THEN UNTIL TRU
E:ENDPROC (291A)
690*SDadd (A90A)
700f=0:PRINT (C396)
710FOR f=1 TO nfields% (3F03
)
720*$&A00=FNtextline (38C7)
730PRINT $&A00 (5B21)
740fn%=fields%(f) (31F3)
750*SDpfield fn% (E761)
760NEXT f (BE9C)
770UNTIL FALSE (25F8)
780: (A912)
790DEFFNtextline (62CA)
800REPEAT G%=BGET#tf%: UNTIL
G%>=32 (C433)
810IF EOF#tf% THEN "=" (9305
)
820t$="" (C701)
830REPEAT (ABE9)
840IF G%>=32 THEN t$=t$+CHR#
G% (444F)
850G%=BGET#tf% (9F8C)
860UNTIL G%=13 OR EOF#tf% (E
C43)
870t$=t$+CHR#13 (F9D4)

```


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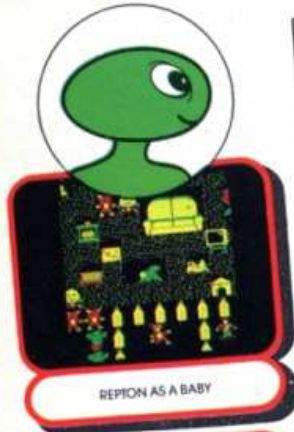
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ADVERTISERS' INDEX

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A&B Binders	37	Micro Studio	61
Archimedes Software	92	Mijas	61
BBC Soft	32	Mitsubishi	10
Beebug	7,69	Morley Electronics	86-87
C&F Associates	31	Nebulae Computer Supplies	103
Clares Micro Supplies	3,5	Norwich Computer Services	92
Computech	37	Panasonic	42-43
Computer Concepts	73,79	Photoplay	70
Dabs Press	11	Slogger	103
Data Store	103	Solidisk Technology	76-77
Data Thorn	103	Star Micronics	85
Electromusic Research	92	Superior Software	IFC/IBC/OBC/23
4Mation	31	Watford Electronics	44-57

The Life Of Repton



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Bono takes the skeletons to a cauldron



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